# THE ELEMENTS
# OF PUBLIC HEALTH ADMINISTRATION

LUCKETT AND GRAY

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BY

GEORGE SPARR LUCKETT, A.B., M.D.

DIRECTOR OF PUBLIC HEALTH, STATE OF NEW MEXICO; CHARTER FELLOW AMERICAN PUBLIC HEALTH ASSOCIATION

AND

HAROLD FARNSWORTH GRAY, B.S., M.S., Gr.P.H.

CHIEF, DIVISION OF SANITARY ENGINEERING AND SANITATION, NEW MEXICO BUREAU OF PUBLIC HEALTH; MEMBER AMERICAN SOCIETY OF CIVIL ENGINEERS; FELLOW AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE; MEMBER ROYAL INSTITUTE OF PUBLIC HEALTH; FORMERLY HEALTH OFFICER CITY OF PALO ALTO, CALIFORNIA, STATE DISTRICT HEALTH OFFICER, CALIFORNIA, ETC., ETC.





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# PREFACE

In the fall of 1919, the authors were called upon to help construct an entirely new state health department, where no organized central health agency had previously existed. Among the many problems encountered was that of instructing the local, part-time health officers in their duties. Most of these physicians had been out of touch with modern health agencies for years; had been busy with their private practice, and were naturally unfamiliar with sanitary procedure as conducted in other communities. To furnish a background of general principles, there was needed an elementary textbook on public health administrative methods, a simple, condensed summary that could be used as a ready reference by the practicing physician who was acting as health officer and who had no time to read the larger works. At the moment, no book which exactly fitted this requirement was available, so it seemed desirable to prepare a set of lessons and to issue them at regular intervals to the local health officers. The object was to tell them the "how" and the "why" of their official duties and to tell it in such a way that they could immediately apply it. Such was the beginning of this little book. It is in no wise intended to supplant the more comprehensive texts, but only to furnish a handy manual of practical suggestions.

There is little that is new or unusual in the contents. The material is partly a condensation and combination of other textbooks and partly a presentation of the practical experience of the authors, an experience that has been gained in a variety of fields, from the Atlantic to the Pacific coasts, in national, state, county and city organizations. The suggestions offered here have all been put into actual practice at one time or another. They may not all work everywhere, but they possess at least the advantage of having succeeded somewhere and of forming a basis for procedure anywhere. Especially is this true of the forms and outlines given in the appendix. While many men fail as health officers because of insufficient technical equipment for their work, more of them fail because they neglect the human factor. The aim here has been to show not only the way to accomplish results, but also how to make the public understand and approve of the work when it is done.

It will be noticed that nothing is offered on the subject of industrial medicine and hygiene. This is a specialty in itself and one that seldom concerns the average county or small town health officer. Therefore, it did not seem pertinent to introduce subjects of little or no value in the day's work.

Acknowledgment must be made of the assistance of Surgeon C. E. Waller, U. S. P. H. S., who was associated in the preparation of the original lessons, reviewing and revising all of them at that time, and who wrote the chapter on Vital Statistics. Without his encouragement and help, it is doubtful whether the task would have been undertaken. It is only in deference to his expressed wish that his name does not appear as one of the joint authors.

The attempt to make the book applicable to a wide range of conditions and at the same time reasonably brief has been found rather difficult. The effort to reconcile two such opposite aims will account in part for any deficiencies that may be found. However, it is hoped that the book will prove of practical value to new health officers of small communities; that it will be useful as a reference on administration in some schools of public health, and that experienced health officers will find in it a new viewpoint on some matters of policy and practice. To the end that it may become most useful to those for whom it is intended, criticism and suggestion are invited. In this connection we must express our appreciation of the helpful criticism and advice of our publishers and of Miss Helen B. Fenton, R. N., throughout the preparation of the manuscript in its final form.

Santa Fe, New Mexico

# TABLE OF CONTENTS

## PART III

### Appendix

# PART I

# ADMINISTRATIVE METHODS OTHER THAN FOR COMMUNICABLE DISEASES

## CHAPTER I

## RELATION OF THE HEALTH OFFICER TO THE PHYSICIAN AND TO THE PUBLIC

Many a promising health officer has had his life's ambition thwarted and his career ruined through failure to appreciate the fact that the human relation is the fundamental thing in successful public work. The health official and many of his staff are in daily contact with the public, both individually and in mass groups. His whole work is constantly and inevitably PUBLIC, as contrasted with the relationship of the private physician to his patient. The impression he and his helpers make upon the public will determine quite definitely whether his work will continue to win popular support. And without support from a majority of the public no governmental enterprise can long continue. For the most part, people fail to discriminate between the person who does a piece of public work and the principle underlying the work itself. If the person is distasteful, his efforts are discredited, no matter how good they may be.

Public health practice was originally an outgrowth of medical knowledge. The facts that were learned regarding the sources and modes of infection were applied by government in an effort to protect its citizenry from sickness and death. It was most natural that only medical men should be entrusted with this duty, since they were then the only ones who had the requisite training. Even today, a large portion of public health work is based upon medicine and the majority of health officers are physicians. What is more natural, then, than that the physicians of the community, with no training in the other aspects of public health practice, should regard the work of the health officer as purely medical? Such being the case, his program and bearing are judged from the restricted viewpoint of a private practice and his public acts thereby fall under censure in the minds of the profession, especially at the outset of his work. Particularly is this true of the publicity, that is so essential to a health department's campaigns, and of the various clinic activities that every well organized department must maintain.

Fortunately, there are usually a few physicians in the community who take a broader view of public health work and through them the health officer can create a more friendly atmosphere. Education of the local profession in the fundamentals of public health practice is an important function of the health officer. If he is a physician, he should make it a point to join the medical society at the earliest possible moment and take every opportunity to present his subject in an interesting and attractive light, avoiding always the didactic as much as possible. The matter offered should deal with those phases of public health which are neglected or ignored in the average medical school and of which the average medical graduate has little or no conception, such as the value of morbidity reports and vital statistics, maternal, infant and school hygiene, epidemiology, general sanitation, etc.

Sooner or later, every health officer will be confronted with the problem of dealing properly with physicians who persist in their failure to make the reports required by law. After repeated warnings, there can be but one course to follow, viz., prosecution. To the rightminded person this is extremely distasteful, but, like a dose of castor oil, something that is occasionally imperative, if the work of the department is to progress and to command the respect of the community. It should always be made clear that legal procedure is a last resort into which the official is forced against his wishes, but which he is compelled to apply in the protection of the public. Very little of this sort of thing is necessary, if the health officer has made the right kind of contact with the local profession.

On the other hand, the medical health officer will have to guard against becoming so deeply involved with his professional brethren that he loses sight of his public relation. An even balance is difficult but essential. However, this consideration should not deter the health officer from giving every aid in his power to physicians who may call upon him for help. He can frequently make a friend for his department by going out of his way to render service. At all times his relationship with the profession should be strictly ethical according to the accepted standards, which is nothing more than true courtesy.

Bearing this in mind, the health officer should have little difficulty in choosing the proper course when handling cases of communicable disease. The attending physician is in charge of the PATIENT and his rights must be respected; while the health officer is in charge of the immediate and remote ENVIRONMENT, including contacts, sources of infection and potential cases. The two functions are distinct and this difference should constantly be emphasized to the profession. The physician holds a private relationship in respect of his patient; the health officer holds a public relationship in respect of the community that employs him. The chief duty of the one is to protect the interests of the individual, while the other is charged with the protection of the public as a whole. The question of diagnosis is often the rock upon which cordial relations between physician and official are wrecked. What is the duty of the health officer? Measured by the yardstick of his public function, there is but one solution of the problem, viz., to act upon his own best judgment as to the nature of the case, regardless of any other diagnosis made. The public interest is paramount. However, guided by the dictates of courtesy, he can avoid giving offense to the physician by saying frankly that the two disagree; that he may be wrong, but that he has no other course to pursue than to rely upon his own verdict, and that where there is a reasonable doubt, the health officer must act on the presumption that the disease is communicable. He should avoid as far as possible any implication that might destroy the confidence of patient and family in the medical attendant.

An important function of the health officer in his relation to the public is that of advisor and teacher in the whole field of hygiene. His position is comparable to that of the safety engineer, engaged by a large manufacturing plant, who not only plans and supervises safety measures, but conducts educational programs among the employees and advises the management as to the causes of, and remedies for, possible accidents that may occur in the future. In order to teach, the health officer must inspire confidence, and to do this requires that he give evidence of sound training and a well balanced mind. The man who is constantly running after fads or propounding mere theories as facts is soon found out and discredited. Not only must his teaching be authoritative, but it should be couched in such terms that the less intelligent groups of the community may grasp the ideas presented. As expert advisor to the governing authorities the health officer must be sufficiently well trained to discover potential sources of disease and suggest practicable means for their eradication.

His knowledge of the experiences of other organizations should be such that he can advise upon the feasibility of plans for the various kinds of welfare work that are suited to his own community.

Cordial relations with the governing authorities must be maintained, otherwise many hindrances to the smooth working of the department will arise. This does not mean that the health officer should be a politician in the ordinary sense of the term. On the contrary, the reproach of "playing politics," of using the office to further any one's political ambitions, will undermine the most effective organizations, for public health can know no creed, politics or sect of any kind whatsoever. It should be a plank in the platform of every party or faction.

Next to the minister and family physician, the health officer probably knows more of the intimate details of family life in the community than any one else. His work is often of a most personal nature, and his ethical standards should, therefore, be of the highest order. Granting that such is the case, he will inevitably gain the confidence and respect of many individuals who will help to create that body of popular approval upon which depends the perpetuation of the work.

Not only does the health officer constantly meet the individuals of the community in close contact, but he must learn to deal with the public in groups, to use that elusive something called "mass psychology," to develop his gift of leadership, to the end that popular movements may be directed toward the goals for which he is striving. This involves, among other things, the proper kind of advertising, of keeping the public regularly informed of the department's activities, and necessitates a friendly relation with the press. For the average physician, schooled in reticence and modesty, such publicity is anathema. The health officer must learn that he is no longer a private person, but a public servant, and that the success of his undertakings depends entirely upon informed public opinion. Wisely used, this publicity becomes at once both a means of educating the public and of gaining the support that is needed. The ancient truism that a fountain can rise no higher than its source is amply illustrated in public health work. Until public ignorance, indifference and inertia are overcome, until there is a determination on the part of the public to have better health conditions, the health officer will fail, regardless of his personal industry, and law enforcement will become a farce.

After all, then, the success of a health department depends not so much upon its financial resources and equipment as upon the character of the man at its head. His personality, intellectual makeup and human understanding are the determining factors in organizing and popularizing his program. It seems worth while, therefore, to mention some of those characteristics that are found in the effective health officer.

1. **PATIENCE** must head the list, for the man of short temper is also usually short on judgment and inclined to resort to force before he has exhausted the possibilities of education.

2. **TACT** in handling the daily problems that arise wins friends where many enemies may easily be made.

3. **PERCEPTION** of the viewpoint and intelligence of those with whom he comes into contact is the foundation of tact.

4. **SINCERITY** coupled with INDUSTRY create in the public mind the conviction that the health officer has the community good at heart.

5. **FIRMNESS AND DECISION** in carrying through a determined policy are the complements of sincerity.

6. Thorough **KNOWLEDGE** of his specialty fosters confidence in, and respect for, the official and his acts, but this special knowledge should be founded on broad general education and culture.

7. Based upon knowledge is **GOOD JUDGMENT** in dealing with questions of policy and administration.

8. There must be absolute **FAIRNESS** to all, with nothing of personal animus in any action.

9. **COURTESY** always.

## CHAPTER II

# ORGANIZATION AND FUNCTIONS OF A LOCAL HEALTH DEPARTMENT

The local health department is the public's real point of contact with public health work. It is therefore the most important single agent in the public health campaign. Without effective local health departments, the health campaign is as impotent as that of an army consisting of a general staff but no soldiers. Putting a health program into effect requires the presence of a man or an organization on the ground actively and promptly attending to the thousand and one details constantly requiring attention. A central state organization cannot do this detail work. In the first place, the central state organization is too far from the persons who present the problems, and cannot have that direct touch with conditions necessary to get immediate results in the individual cases. In the second place, if the central organization attempts to handle the details of local affairs, it cannot perform its own proper functions of coordinating, standardizing and supervising. Another important consideration is that of local pride. A community will usually have pride in a good thing of local origin, and remain indifferent to something just as good but not its own. A wise health officer develops and stimulates this local pride by making his people proud of *their* health department.

The functions of local health departments group themselves as follows:

I. *Registration and Interpretation of Vital Statistics.*
(*a*) Births.
(*b*) Deaths.
(*c*) Communicable diseases.
(*d*) Reports to State Health Authority.
II. *Control of Communicable Diseases.*
(*a*) Verification of diagnoses.
1. Clinical.
2. Laboratory.
(*b*) Investigation of sources of infection.
(*c*) Searches for carriers and "missed" cases.
(*d*) Isolation and quarantine procedure.
1. Establishment.
2. Supervision.
3. Release.
4. Terminal disinfection.
(*e*) Exclusions from school and readmissions, on account of communicable disease.
III. *Child Hygiene.*
(*a*) Prenatal work.
(*b*) Infant hygiene.
(*c*) Care of the preschool child.
(*d*) School hygiene and medical inspection of school children.
IV. *Sanitation.*
(*a*) Water supply.
(*b*) Sewerage.
(*c*) Wastes disposal.
(*d*) Rodent destruction.
(*e*) Prevention of fly and mosquito breeding.
(*f*) Industrial sanitation.
(*g*) Nuisances.
V. *Housing.*
VI. *Milk and Food Sanitation.*
(*a*) Milk.
1. Inspection and scoring.
2. Laboratory.
3. Pasteurization.
4. Standards and grading.
5. Permits.
(*b*) Meat inspection.
(*c*) Sanitation of food-handling establishments.
VII. *Education.*
(*a*) Printed matter.
(*b*) Newspapers.

(c) Lectures and talks.
(d) Visual (motion pictures, etc.).

VIII. *Clinics.*
(a) Well-baby.
(b) School.
1. Medical.
2. Dental.
(c) Venereal.
(d) Tuberculosis.
(e) Special (*e.g.* hookworm and life extension).

Many of these functions are considered in some detail in other chapters, but at this point a few statements of practical value, with reference to the above outline, are in order.

I. The health officer must be a "go getter" in respect of certificates of birth and death, and reports of communicable disease. He cannot know either the current state of health of his community, nor whether his work is effective, unless he has complete and accurate records. He should learn to study and classify these records according to proper statistical methods and to interpret them accurately in terms interesting to, and understandable by, his community.

II. (a) The final decision as to questions of diagnosis in communicable disease rests with the health officer, or, on appeal, with the state health authority. But this decision should be made both justly and tactfully, so as to secure the cooperation of the local medical profession. The health officer ought to verify diagnoses. Where he disagrees, he should use the greatest tact and discretion, and endeavor to have the attending physician change to the correct diagnosis by skillful suggestion. Let him "save his face" before his patients.

(b) and (c) These are very important parts of the health officer's duty. They are comprised under the term "epidemiology." The first question which should come to mind is, "What was the source of infection in this case?" The source must, if possible, be found, so as to control it and prevent further infections. The second question should be, "Who are the contacts with this case, or possible carriers, who may spread the infection?" They must be found promptly and controlled.

Do not stop with the isolation of the case. That is only the beginning. Each case should be simply the starting point for an investigation which should not cease until the source of infection and all ascertainable avenues of spread have been discovered and controlled.

(*d*) The mechanics of isolation and quarantine, such as placarding, supervision and release, may be performed by the health officer's assistants (inspectors and nurses), thus relieving him of routine. But he must exercise sufficient supervision to see that this work is properly and effectively done. It is particularly important to oversee concurrent disinfection in the homes of the ignorant and slovenly. Although routine, the manner in which isolation and quarantine, release and terminal disinfection are performed can make or break a health department. The work should be so systematized and standardized that it takes a minimum of time and expense, and at the same time must be done tactfully. People are apt to be a bit upset in time of sickness. Courtesy and consideration, but with firmness in requiring compliance with the regulations, are necessary.

(*e*) Remember that the health officer usually has no authority to exclude a child from school. It is the duty of the school authorities to exclude. Secure team-work and cooperation with them. Make it easy for them to do their part. If necessary, make them do it by legal measures as a last resort, but do not attempt to do their job or exercise their authority. Of course, the health officer can always quarantine children who have been exposed to disease, if they are likely to spread infection.

III. The field of infant and child hygiene offers nearly one-third of our opportunity to reduce the community death rate. It is also the field of work which as a rule receives the greatest public support. Enlist that support, and do the work. When results are secured, remember to say, "*We* did it," not "*I* did it." Give plenty of credit where due. Make friends with the children and make them friends of the health department. Today's children are tomorrow's voters.

IV. (*a*), (*b*) and (*c*) Water supply, sewerage and wastes disposal are engineering problems. They are best handled by the municipal Department of Public Works, or its equivalent. The health officer should cooperate and advise, but he should not attempt to handle these matters himself, except in special cases. He should actively campaign for 100 per cent sewer connections, or for sanitary privies where there are no sewers. He should make inspections to see that the water supply is not being contaminated. He should see that manure and garbage are not permitted to accumulate so as to breed flies. But he should not boss the sewer department, nor run the waterworks, nor operate the garbage collection system.

(*d*) The best approach in industrial sanitation is to show the employer the gain in efficiency of his labor force which will occur if they work under sanitary conditions. Do not try compulsion until every appeal to self-interest has been exhausted.

(*e*) "Nuisances" are nuisances to the health officer as well as to the complaining citizen. Often the complaint has little to do with public health. But do not argue the case with the complainant. Thank him! It may be that he complains to the health officer, when it is the proper business of the street department or the police. If so, refer it to the proper officials. Ask them to attend to it properly. Then the citizen will say, "We have a real health department. I called up the health officer and he sent a man right out and removed the dead dog in front of my house." Next time he may have something important to report and will do so with confidence that it will be attended to.

V. Spend plenty of time on milk inspection. If possible, the health officer should have a small laboratory and make bacteriological examinations of the milk. Score dairies by the standard score card and publish the scores and the results of the bacteria counts. The public is interested, and it stimulates the dairymen to compete for a high standing. Improvement of the milk supply helps to reduce infant mortality, especially in summer. It is worth considerable effort. But do not spend too much time on other food inspection. Do enough to satisfy the public that the matter is being given adequate attention. Medical inspection of food-handlers is more important in reducing communicable disease than is sanitary inspection. Do both, in proper proportion.

VI. Keep the public constantly informed as to the work of the health department. Report results. Tell the newspapers what is being done. It is news, and they are glad to print it. A good editor or reporter can help to give an understanding of just what constitutes "news," and how it should be presented to interest the public. Keep the work before the public, with favorable comment if possible. Even criticism is better than indifference. To the average physician such publicity may be a bit distasteful, but as health officer he is a *public* personage, performing a work in which the public is interested and concerning which it has a right to definite and complete information. The right kind of publicity helps the work. But it should actually advertise the department, not the man. Use the "news" as a hook on which to hang some useful piece of health education. The public will seldom read a health article, but by tying the same information, briefly and concisely, to a news item it will carry the message.

VII. In a few diseases adequate treatment or cure of a case is an effective public health measure, in that it eliminates a source of infection. For this reason, venereal and tuberculosis clinics have a definite place in the health program. On the other hand, well-baby and school clinics have a valuable place in health work because they correct defects which may lead to disease or physical deficiency. Free "life extension" examinations for the adult population is also excellent preventive work. Make the clinics preventive as well as corrective. In the smaller communities they must be carried on largely by voluntary cooperation of physicians and dentists. It is unwise to organize a clinic until there is a satisfactory means of following up each case to ensure cooperation of the patient, regular attendance and the correction of harmful social conditions that may prolong the illness or produce a recurrence.

How should the local health department be organized to effect the results desired?

In the first place, there must be a single executive head. This man is usually designated as the health officer. Often this is as far as the organization goes, and the health officer acts as executive, medical inspector, sanitary inspector, laboratory technician and clerk, all in one. When this is the case (as it usually is in small counties and villages) the problem is one of organizing his own time, rather than of directing the work of others. Fortunate is the state that has abolished the obsolete local "Board of Health," and placed the responsibility and duty of enforcing health laws squarely upon the health officer. Several heads may be better than one for counsel, but one head is much the best for action.

The usual personnel of a small full-time health department is the health officer, a public health nurse, a sanitary inspector, a laboratory technician, and a clerk. The last two positions are sometimes combined. This is about the minimum practicable organization. Expansion of this minimum follows along the line of adding specialized nurses and inspectors, as infant hygiene nurses and school nurses, or dairy inspectors and food inspectors. In addition, clinic physicians and various medical inspectors may be added to the staff. Special clerks may be detailed to handling the statistical work only. At least the health officer and the minimum staff must devote all their time to their duties. Outside interests, especially if profitable, work against adequate attention to duty and inevitably result in a neglect of the public business. Some of the staff, however (clinic physicians and medical inspectors) may well be on a part-time basis.

Each one of the positions indicated requires definite qualifications for successful work. The **health officer** must be an efficient executive. No amount of technical knowledge will compensate for lack of administrative ability. He must be able to plan his work, and then direct his subordinates toward the definite aim of that plan. He must also have a pleasing personality. He should also be broadly educated, rather than merely "stuffed" with technical information. Further, the *health officer* must *have a public health training and viewpoint.* A medical training is not sufficient. It requires a mental wrench for the average physician to readjust his ideas when entering public health work without special preliminary training. He is apt to have the individual or personal viewpoint, as developed from contact with his patients, rather than the public viewpoint. He is apt to adopt the "*ex cathedra*" attitude, which is all very good with his sick patients, but reacts the wrong way on the well public. Without special public health training the average physician is without knowledge of statistical procedures; his epidemiology is apt to be hazy; he knows little about dairy inspection, housing, industrial sanitation, or the engineering health problems. Even more important, he knows nothing, or next to nothing, about public health law, or the subjects of municipal finance, budgets and accounting.

Although these limitations look formidable, yet in spite of them a physician with the proper personality is to be preferred *as a rule* for the position of local health officer. Public opinion usually requires it, and a physician can do properly and legally a number of things that it is best that a non-medical health officer should not attempt, even if by special knowledge he were qualified to do so. It should be admitted, in fairness, that many specially trained non-medical men have made brilliant successes as local health officers. We doubt if any state, on the whole, has better local health *administration* than either Massachusetts or New Jersey, and in both these states there are non-medical health officers doing valuable work. Usually they are graduate sanitary engineers with a post-graduate public health training. To boil the matter down to essentials, it is not the particular combination of letters after a man's name, but his knowledge, ability and personality, which bring success in this, as in any other field of endeavor.

Where there is much diagnostic work to be done, or clinics are a part of the department's work (and also where the health officer is not a physician), one or more **medical inspectors** are a part of the staff. These men must be skilled diagnosticians, tactful, and with pleasing personalities. Not every physician makes a good medical inspector for the reason that he often fails to recognize the early stages of communicable disease, or the mild, atypical cases. This is especially true in scarlet fever and smallpox.

The **public health nurse** should be a graduate nurse, from a standard training school, a registered nurse if possible, and with at least some special training in public health nursing. They should have an abundance of tact and discretion, pleasing personalities, and some teaching ability. No members of the staff are in such intimate personal contact with the people as the public health nurses, and great pains should be taken in their selection.

In selecting **inspectors,** not so much stress need be laid on technical training. Active, intelligent, observant young men of good address can be made into satisfactory inspectors with study and with training that the health officer can give them. Meat inspectors, however, should be graduate veterinarians, and a graduate veterinarian usually makes the best dairy inspector.

The **laboratory technician** should certainly be well-trained in bacteriology, but need not, in a small department, be an expert, if the health officer can personally supervise the work. Women make excellent bacteriologists, being careful and willing to take the infinite pains with details that this work requires. In small health departments the bacteriologist can also act as **clerk.**

In planning the work of his department, the health officer should endeavor to adjust his work in such a manner as to obtain the greatest results from his efforts. In order to do so, he should have some knowledge of the relative values of the different phases of public health work. Several attempts have been made to evaluate public health procedures. One of the most logical is that of Franz Schneider, who, after a series of interesting calculations, has arrived at the following results:

Table I

| | Per Cent |
|---|---|
| 1. Control of communicable disease: | |
| (a) Tuberculosis | 12.1 |
| (b) Venereal diseases | 6.6 |
| (c) All others | 25.3 |
| 2. Infant hygiene | 20.3 |
| 3. School inspection | 7.0 |
| 4. Privy and well sanitation | 3.5 |
| 5. Fly and mosquito control | 2.4 |
| 6. Milk control | 2.7 |
| 7. Food sanitation | 0.1 |
| 8. Vital statistics | 5.0 |
| 9. Laboratory | 5.0 |
| 10. Education | 5.0 |
| 11. Clinics | 5.0 |
| Total | 100.0% |

This table was based on average conditions and the relative values will vary in different parts of the country. For example, in unsewered towns and malarial districts, fly and mosquito control will have a higher relative value; in towns of low moral standards, venereal disease control measures may be rated higher. A different emphasis might be given to various items in rural districts from that given in large cities.

Although much of the preceding discussion has dealt chiefly with the problems of municipal health departments, it is applicable also to county health work. The emphasis must be changed, but otherwise the statements are valid for rural districts. In the country and the small towns more attention must be given to sanitation. While in the city sanitation may best be handled by the department of public works, in the country the health department must do it. Privies and wells, flies and mosquitoes, are larger problems in the rural districts. Food and milk sanitation is somewhat less important in the country than in the town. Housing is less urgent, as there is less overcrowding, and more wholesome outdoor exercise. Clinics are of little value in rural districts, unless they are traveling clinics, but visiting nurses and visiting medical and dental inspectors are highly useful.

In counties where the towns are comparatively small (say less than 25,000 population) there is a tendency to consolidate into one health department for the county and all the incorporated towns. This scheme has many advantages and but few defects. It enables the entire county to have a full-time health organization at a reasonable expense, that would be almost prohibitive if a single community were to attempt it alone. There is also the advantage of uniform control over the entire area. As a rule, the county seat is the center of business and social life for the county. A unified health department gives the health officer supervision over the many sources of infection and the movements of contacts.

## CHAPTER III

# FINANCE AND MANAGEMENT

Every health officer has to face two problems of the utmost importance. One is the obtaining of funds to carry on his work. The other is the management of these funds to secure the best results. Because these subjects are so dependent upon popular opinion, they will be discussed in connection with methods for building a public opinion favorable to an adequate support of health work.

Health officers must realize keenly at all times that public health work is a function of government, a part thereof, and that funds for maintenance are derived from taxation. The more the health officer knows about governmental forms and practices, and especially governmental finance, the better able he will be to cope with the governing authorities to whom he looks for appropriations. It is highly desirable that every health officer thoroughly study some good texts on governmental forms and finance, such as Bryce's "American Commonwealth," Munro's books on municipal government, and Plehn's "Introduction to Public Finance."

As a general rule, the money for the operation of a health department is obtained through the operation of a "budget." This is simply a financial plan for the operation of a state, county or municipality for a fiscal year. The budget, or financial plan, is based upon the estimated needs for the operation of the entire government (state, county or city) for the next fiscal year, after these needs are balanced against the estimated revenues. Many budgets are crudely made. Politics, favoritism, prejudice and precedent frequently play a larger part in their construction than analysis of necessities, or sound public policy. Certain departments which are well established, as the courts and the police, are apt to get practically what they demand, while the welfare departments, often public works, and at times even fire departments, get less than should be expended to obtain satisfactory results.

It is a standing complaint that health departments are inadequately supported financially. Very often this is due in large part to a failure of the health officer to play the game according to the rules. If he is a purely political appointee and stands in with the "gang," he seldom knows anything about public health practice, and cares less. Places are made for political workers, and enough "pap" handed out to go with these jobs; but no attempt is made to work out a financial plan on the basis of the health needs of the community.

On the other hand, if a physician inexperienced in public health work is appointed, he may adopt the "*ex cathedra*" manner, and try to tell the governing board what to do. This manner works very well with his patients, but doesn't go at all with the town council. The town board resents being told. Even when the health officer asks, he must have some strong support back of the request, and then stay everlastingly on the job until he gets the amounts needed.

The full-time, trained and experienced health officer is in a better position to obtain funds than either of the former types, if he analyses his needs and presents a comprehensive budget analysed, explained and fully supported by data and a public demand.

The request for funds should be made up in a tabular form, in considerable detail, but grouped under a few main headings, such as salaries, transportation expense, equipment, operating expenses, contingencies and miscellaneous. In large health departments these groups may be prepared for each bureau or division separately, but in small departments segregation functionally by divisions or bureaus is unnecessary. Each item should be numbered or otherwise designated and explained concisely in a supplemental sheet, the two together forming in effect a plan of work and a detailed statement of its cost. This plan should then be given to each member of the governing board and gone over in person with him, explaining every item on which there is the slightest question.

In planning the estimate, it is well to keep in mind a table of relative values in public health work, such as Schneider's or Chapin's. As nearly as possible expenditures should conform proportionately to the ultimate value, from a health standpoint, of each activity or function. In small departments this is difficult, if not almost impossible, and in large departments statutes and ordinances may interfere by requiring the performance of certain phases of the work on a greater scale than proper balance would justify. But within such limits a balance of expenditures by function should be obtained, in accordance with the importance of each function as it relates to the saving of lives, the improvement of living conditions or the promotion of positive health.

One health officer who has been quite successful in obtaining his budget requests made it a practice to begin work on the budget several months in advance of the time of presentation, at the same time launching a definite campaign to get it through. Supporters of the department were asked to see members of the town council at intervals, and in a general way ask for adequate financial support for the health department. This gave the impression of a strong public interest and support. When the preliminary estimates were called for, he took his figures to each individual councilman and explained them thoroughly. When the budget committee met, he was on the job, regardless of whether his estimate was under consideration or not, and made himself generally useful in checking and computing and displayed an interest in the entire proceeding. This being "on the job" was kept up until the entire council had passed the budget and the matter was closed. At the council meeting on the budget he always had a large delegation of influential citizens present and they discreetly let it be understood that they were there to see that the health department got what it needed. He found that the councilmen were favorably influenced by these measures, and he managed to get increases each year in spite of occasional strenuous opposition.

While the method may not be followed in detail in every community, the underlying idea of a concerted campaign and constantly being on the job can be carried out everywhere.

There are two general types of budget, the "segregated" and the "lump sum." In the former the various amounts allowed are specified in more or less detail; while in the latter a single lump sum is allotted to each department or function. The lump sum budget is practically worthless to the governing board as a means of controlling expenditures, and a too greatly segregated budget may prove inflexible in emergencies or under suddenly changed conditions. Beware of too great segregation in the *budget,* but give considerable detail in the *estimates,* to show the reason for the requests under the major items of the final budget.

In preparing the estimates it is almost essential that a comparison be made with the actual expenses in the previous year, or better the previous two or three years. In order to be able to make such a comparison it is necessary to have an accounting system which will show how the money has been spent, both by the kind of expenditure, such as salaries, equipment, postage, printing, etc., and by function, as for preventable diseases, vital statistics, sanitary inspection, child hygiene, etc. If the auditor or clerk does not keep such a record, the health officer should do so himself for his own protection and guidance.

When operating under a budget, it is helpful also to divide the various allotments into twelfths, and each month check up to see whether expenses have run over or under the average, and whether the total expended to date is more or less than the proper proportion. If possible it is best to spend a little under the average allotment, so as to have some reserve for emergencies. At the end of the fiscal year any available surplus can be easily expended for supplies for the next year, if the budget is not too rigidly segregated and detailed.

Adequate appropriations are the life-blood of a health department. Everything the health officer does should be performed with an idea, at least in the back of his mind, as to how such action will ultimately affect his budget. By that we do not mean that any "pussy footing" or "trimming" should be resorted to, but that positive efforts to affect favorably the opinion of the appropriating body should be always in mind. This opinion may be affected both directly and indirectly, and the campaign should be on at all times, merely being intensified and strongly focused when the annual budget is under consideration.

The people who form public opinion may be roughly classed as

1. Officials
2. Leading Citizens
3. Organizations
4. Average Citizens
5. Kickers.

Each of these groups should be reached in a slightly different manner, but all can be brought to support the health department if skillfully handled.

The governing board or council should be kept in close touch with the work of the department. Monthly and annual reports should be presented to it, but as reports are seldom read, it is best to take up individually with each member the "high lights" of every report. Keep them informed and consult them as to general policies. If possible, the health officer should get each member to do him an occasional favor, and in return he should give these officials credit for any success he may have.

If the health officer is working under a city manager, many difficulties are avoided, as there is one man rather than many to deal with in respect of most administrative matters. But, aside from the city manager, there is a whole family of officials whose good will is valuable and whose cooperation is often very helpful.

The police have access to information of use to the health officer, and they also can be helpful in reporting nuisances, quarantine breaking and other matters of interest. As a rule, this help can only be obtained if the health officer cultivates the chief and the individual officers, and gets these reports as friendly assistance. Any attempt to force this assistance through executive order or direction usually is a failure.

The fire department also will be an ally, especially if much interested in fire *prevention* work. Rat-harbor and fire hazards are often closely linked, for example.

The school authorities almost always cordially cooperate with the health authorities. But they must be handled carefully, and the health officer must not even seem to interfere within their jurisdiction. Schoolmen have their pecularities, and are generally a bit sensitive. If the health officer can make them feel that each is cooperating with the other for mutual benefit, relations will be on a better basis than if there is no evidence of their being an important part in the cooperation. Playground and recreation officers, and the department of charities and corrections, are natural allies of the health officer, and this natural tendency should be strengthened by courteous and helpful cooperation by the health officer.

Long before it is ever necessary to take a case into court the health officer should be personally well acquainted with the local judges. It is highly advisable to talk informally with them about health work, and give them a clear insight into what the health officer is doing and trying to do. The health officer should try to get them to instruct him in the proper legal procedure to take in the various cases that might come up, and also he should learn the local court customs and prejudices, if there be any. After several interviews on a general friendly basis, it is well tactfully to try to get them committed to a general policy of enforcement of health laws, without reference to any specific cases. The prosecuting attorney should also be made a friend. Then when it finally becomes necessary to go into court the health officer's way is easier and that of the transgressor harder.

When working in rural districts the agricultural agent or farm advisor, and his co-worker, the home demonstration agent, are valuable allies, who are almost always glad to cooperate with the health officer and have him cooperate with them. The rural people can probably be reached more easily through their Farm Bureau meetings in various parts of the county than in any other way. The agricultural agent is the man to put the health officer before these meetings on the best possible basis.

All the members of the official group form a body of public opinion and assistance which can be quickly brought to the health officer's aid, if he has made friends with them.

Equally, if not more, important are the "leading citizens," who are often the "power behind the throne." It is necessary for success to find out promptly who these men and women are, and to cultivate their acquaintance in a friendly yet dignified way. Each one must be studied individually, to learn what his fundamental motives are, and what are his greatest interests. There are no "rules of the game" with leading citizens; make as many as possible your friends and allies by whatever means seem honorably possible. The more of them who will go to the bat for the health department when it strikes difficult times, the safer the health program of a community will be.

Leading citizens and officials are the most quickly mobilized group of public opinion. The next are the various organizations, such as the Chamber of Commerce, Rotary and Kiwanis Clubs, Women's Clubs, Farm Bureaus, etc. These can help greatly, often unselfishly, but as a rule the greatest results are obtained from them if they can be given something definite and concrete to do, such as drives and clean-up campaigns. Occasional talks, brief and pertinent, before these organizations, backed up by a personal acquaintance among their memberships, help to build a second body of public opinion favorable to the health department, and which can be mobilized fairly quickly.

In the long run the underlying and decisive public opinion is that of the average citizen. He is, however, rather difficult to reach quickly, and his reactions to health work are mixed, sometimes uncertain and usually slow. As a rule, however, he tends to support an official agency which is actively and effectively doing its job, provided he finds it out in a convincing manner. Steady newspaper publicity helps with the average citizen. The health officer, his inspectors and especially his public health nurses can gradually reach a considerable part of the population, and in time build up a prestige based on good work pleasantly and efficiently performed.

There are always present a small number of chronic kickers, in any community. They are annoying, but seldom need be taken very seriously. It is well to listen to them courteously; to sympathize with them if possible; to soothe and appease them as tactfully as may be. With those who cannot be handled, the best policy is to be patient and forebearing. Chronic kickers have few friends, and if the health officer's bearing when under their attack is dignified and gentlemanly, other people will in time come to his rescue and rout them for him.

The health officer must make all possible kinds of contacts with his community. Success depends largely on how well he is liked as a human being, as well as on the effectiveness of his work. Men who are in the work sometimes remark that they do not care what the public thinks of them personally, provided they like their work. This attitude is absolutely wrong and dangerous. Unfortunately the great majority of people are not so constituted as to judge matters impersonally, and cannot divorce their estimate of the work done from their reaction to the personality of the man doing the work. Good advice is to "make friends" and above all to "mix," especially to "mix."

In order to mix well and to gain friends, the health officer must consciously strive to improve his own personality and ability. He should read the local papers carefully to know what is going on in his community and to follow the trend of public opinion. He should also read steadily and broadly on general topics, and be able to discuss these intelligently but without controversy. If he has ideas only on his specialty people soon tire of him. The one track mind is always a bore. He should try to improve his power of self-expression, both in speech and in writing, through study and observation. The ability to speak and write simply and effectively, without frills or rhetorical effects, but sincerely and clearly, is a tremendous asset in any work.

Outside contacts should be maintained, to receive inspiration and a knowledge of new practices and principles. Membership in the American Public Health Association is essential, and the health officer should, if possible, attend its annual meeting, even at a personal sacrifice. Most certainly he should attend every meeting of his state's health officers' association, and take an active part in its affairs.

Perhaps some health officers will feel that their duties are too arduous and time-consuming to permit them to do all or even a small part of the things suggested in this chapter. The remedy lies in better organization of the work, in the development of whatever latent executive ability they have, the systematizing of routine work, and the delegation of as much detail as possible to subordinates. The day's routine should be reduced to the simplest procedures and the shortest possible time, even if days or weeks of study, experiment and planning are required to accomplish the result. The health officer must have time to think, to plan, to direct, and above all, to build good will and community support. No matter how good a job, from a technical standpoint, he has done, he has failed unless his public likes the result and is willing to continue on a basis of adequate financial support.

## CHAPTER IV

## OFFICE AND CONTROL SYSTEM FOR SMALL HEALTH DEPARTMENTS

The proper management of a local health department involves much record keeping. Part of it is required by state regulations, which demand certain reports to be made to the state health authority at stated intervals. Beside such reports, a record must be kept of various activities of the department, for information of the health officer himself and for the information of the local governing authority and the taxpayers, who are properly entitled to a report of accomplishment. Such records have historical and comparative value over a period of years.

But, aside from such, there are other and, from an administrative viewpoint, more important records to be kept. Some operations must be controlled and routine simplified and standardized, to bring about certainty and definiteness of performance. A few examples will suffice.

1. When Mrs. X's small boy is isolated on account of measles, her first question usually is, "How long will he be kept home?" If the answer is "five days," Mrs. X expects someone from the health department early on the sixth day to remove the placard and if no one appears, she is convinced that the health officer is either negligent or inefficient and she is correct, for if the health officer has the right kind of office system, such an incident, trivial to him, but of much moment to her, would not occur.

2. Mrs. Y telephones to the health officer about an alleged nuisance which offends her. The health officer or

his inspector investigates and finds no cause for complaint, or finds that it is a matter for another official to handle. Nothing, however, is said to Mrs. Y, and nothing apparently is done about it; Mrs. Y, therefore, decides that the health officer is indifferent, or worse. If system were in effect in the local health office, Mrs. Y would be courteously informed as to the findings of fact and what action had been, or would be, taken, and if not, why not.

3. Mr. *Z* has a dairy and his cows have been tested for tuberculosis, but the dairy inspector asserts that new cows, not tested, have been added to the herd. Dairyman *Z* denies this. The inspector repeats his assertion and hard words ensue. If a proper record of this dairy had been kept, there would have been such positive and definite identification made and recorded for each cow that no dispute could have occurred.

In planning a control and record system for a small health office, the health officer should study his requirements very carefully, before adopting any forms or spending money for printing. The forms should contain every essential fact, and omit non-essential items. Forms should be simple, with items logically arranged in the order in which the data are most frequently or most conveniently obtained in the field. Stock sizes of cards or sheets are advisable, and as few sizes as possible should be adopted. Every required form can be printed on two, three, or at the most, four standard sizes, e.g., $8\frac{1}{2}'' \times 11''$ sheets and $4'' \times 6''$ cards as the best two sizes, with $6'' \times 8''$, and $3'' \times 5''$ cards, as supplemental.

A few specimen forms are given in the appendix. These forms are in successful use in well-managed small health departments, and are presented, not as models, but as suggestions which will be helpful to health officers in planning their own forms.

*The Communicable Disease Card.*

This card serves at once the several purposes of a record, a control, and an epidemiological investigation form, for all the usual communicable diseases.

As soon as a report of a case is received, the disease and name and location of the case are entered on the card, and given a serial number. The card is then taken into the field and the epidemiological data and control measures are entered on it. The card is then placed in the current file, in the order of its serial number, with a signal, or signals, on it at the date point on the upper edge, to indicate the future action to be taken with the case. Various colored steel signals can be used to indicate different procedures. For example, inspection for release, release without inspection, visit by the nurse, culture to be taken, report to be received from attending physician, etc. Each evening, the cards on which signals are set for the next day are listed under the kind of work to be done, and the next day's routine thus planned, in part, for each member of the staff. In compiling monthly or weekly reports, or in statistical tabulations, the entire set of cards can be removed from the file, sorted easily and counted in as many categories as desired.

If a record of "carriers" is kept, a duplicate card can be placed in a special "carrier" file.

*Births and Deaths.*

As soon as a birth or death certificate is received, it should be carefully examined by someone who is familiar with statistical procedure in connection with these records, and if any action or investigation is required in connection with the certificate, a slip of colored paper should be clipped to the certificate to call attention thereto. Several colors may be used, with a penciled memorandum. For example, a birth certificate may come in with missing items; a red slip is attached with the numbers of the missing items noted thereon. Or, the given name may be omitted; a blue slip is attached and the supplemental report filled out and mailed to the person who can make the report. Or, if there is an error, a yellow slip is attached. When the certificate is complete, the colored slip is removed. In the meantime, the certificate is safely kept in the file.

With death certificates, several points are important and must be checked up. For example, every stillbirth, and every death under one year of age, should be checked to find out if a birth certificate has been filed. Every death from a notifiable disease should be checked against the communicable disease reports. Missing items should be obtained and errors corrected. Especially should the cause of death be scrutinized and, if not satisfactory, additional or corrected information must be secured. Undesirable or indefinite terms must be replaced by exact, definite and accepted causes of death. Certain causes of death, under some circumstances (e.g. nephritis or septicaemia in a woman of child-bearing age) must be queried for additional information to enable an accurate classification to be made. Where any such points arise in connection with a death certificate, a colored slip should be clipped to the certificate and kept there until the data are complete and satisfactory in all respects, or the corresponding birth certificate or disease report is filed, as the case may be.

In tabulating causes of deaths, it is an unnecessary refinement to use the complete International List of titles with small populations (say under 100,000). An abridged list of 26 titles can be substituted with great saving in time and in printing costs. Such a form is shown in the appendix, which can be printed on $8\frac{1}{2}'' \times 11''$ sheets and used for classifying deaths by causes and by various groups, such as age, sex, nationality of parents, occupation, etc.

*Nuisances.*

Although relatively unimportant, nothing can make or break a local health department in the estimation of the public more quickly than the method of handling nuisance complaints. If attended to promptly and effectively, the public is pleased and believes that all of the work of the department is efficiently performed. If neglected or indifferently handled, the people are convinced that there is negligence, favoritism or worse.

Usually two forms are required for this work; a record and a notification to abate. The notification should be simple and brief and made in duplicate by means of a carbon, in case legal action should become necessary. Wherever possible the signature of the recipient of the notice should be obtained on the duplicate which is retained.

The record form should be adapted to the receipt of complaints as well as to the finding of nuisances in the course of routine or special sanitary inspections. A space should be provided for recording the nature of the complaint, and also the inspector's findings of fact.

A form which was devised to serve as a record and notice combined is shown in the appendix and has proved very useful. The name and address of the complainant are entered only in the duplicate (yellow) sheet. The office in which this form was used made it a practice never to divulge the name of a complainant; always to inspect the premises of the complainant before investigating the nuisance, and to refuse to act on anonymous complaints. This reduces complaints to a minimum of real grievances, and helps to keep the department clear of neighborhood squabbles.

*Dairy Records.*

Six forms are advisable in the control of the milk supply. They are

| | |
|---|---|
| 1. Application for a permit | If such is issued by the health officer. |
| 2. Permit | |
| 3. Score card | |
| 4. Laboratory record | |
| 5. Cow record. | |
| 6. Report to dairyman of laboratory results. | |

The application for a permit, and the report to dairyman, should be on a 3″ × 5″ card, which can be mailed as a postcard (the regular postcard size should be avoided in forms, on account of difficulty in filing). The permit may be printed on a 6″ × 8″ sheet. The score card is printed on 8½″ × 11″ sheets, as is also the laboratory record. The cow record is easily handled on 4″ × 6″ cards. Specimens of satisfactory forms are presented in the appendix.

No method of scoring dairies that is free from objections has as yet been devised. In the opinion of the authors, the Bureau of Animal Industry Standard Card gives too much weight to factors of relatively little importance in the South and West, while the Woodward method of scoring is cumbersome in operation and not readily understood by either the dairyman or the public. For our own use, we have devised a modification of the B. A. I. card, which, while its logical defects are admitted, gives better results in practice.

The dairy cow record card is made out at the time of the original inspection at the dairy and undoubtedly requires time and some skill. The time and effort are well spent, however. Additional cards are made out as new cows are added to the herd. These records are unnecessary where the milk is pasteurized.

*Laboratory Reports.*

Reports on specimens submitted to the local laboratory, if positive, (and also copies of positive reports from the state laboratory) should be checked against the reports of communicable diseases. If a report on the case has not yet been received, a signal should be attached to the laboratory report until the case report comes in.

Laboratory results should be transmitted as promptly as possible, preferably by telephone, followed by a written $3'' \times 5''$ postcard form report by mail, as a confirmation. The laboratory record card should not be filed until the report is made. Reports of milk examinations should be mailed (on $3'' \times 5''$ postcard forms) to the dairymen.

*School Medical Examinations.*

Where physical defects are found in school medical examinations, it is a good plan to attach a signal to the record and remove it only when the defect is corrected or the child has left the community.

*Diary and Scrapbook.*

Every health officer should keep a diary or daily record of every event of any importance. This may well be on $8\frac{1}{2}'' \times 11''$ sheets in a looseleaf binder, which can be permanently bound at the end of the year.

A scrapbook record should be kept of all newspaper items and publicity concerning the health department.

The health officer should also prepare and enlarge, as his experience increases, a looseleaf notebook of data of all kinds. This should be of handy pocket size for constant reference, and should contain digests of all state health laws and regulations, local health and sanitary ordinances, differential diagnoses, and useful data on all kinds of health subjects. In time this will become a valuable help and the health officer's constant companion. The sheets should be typewritten for clearness and compactness.

*Office Equipment.*

The effectiveness of a health officer's work depends to a considerable extent on the efficiency with which his office routine and records are handled. The office equipment can materially aid or obstruct efficiency.

The best desk is the so-called "efficiency" type of flat-topped desk, the drawers of which contain card files and $8\frac{1}{2}'' \times 11''$ files for current matter. A "desk organizer" for current correspondence is an excellent means of keeping the desk neat and clear of loose papers, while a tray in the middle drawer conveniently holds signals, map tacks, pens, pencils, clips, rubber bands and other necessary small articles.

There should be a stack of letter files and card files, preferably unit-built, so that equipment can be added as required. This file should also contain the birth and death index. A substantial book case should be installed, to contain not only the health officer's technical library, but also volumes of government mortality statistics, bound health reports, bound copies of birth and death certificates, etc.

A series of maps of the county, city or district, preferably mounted on swinging map frames, is very desirable for spot maps.

If possible, a duplicating machine for form letters and publicity, and a small hand-operated addressing machine, should be obtained, as these are great time savers if any considerable number of form letters or bulletins are sent out. The duplicating machine can also be used to prepare office forms of some kinds. In small quantities, this is cheaper than printing.

As a general rule, the average physician is not skillful in "paper work" or the systematizing of routine. Many, in fact, seem to scorn and deliberately neglect it. But in a health office, system must be obtained and maintained, to accomplish results. The health officer of real ability will so organize his work that the routine is handled thoroughly and effectively, with a minimum of effort and time. Unless he can do so, details will master him and draw him from his more important functions of planning and executing. A lack of system will result eventually in a lack of public confidence in the man and his work, as he will soon be recognized as inefficient.

*Purchasing.*

If the municipality or county does not have a purchasing agent, the health officer should exercise especial care in regard to making purchases. Wherever possible, bids should be asked from all firms selling the product desired, and the lowest bid accepted. It is a good plan to enter all bids received on 3″ × 5″ cards, giving the name and address of the bidder, the quantity bid on, the price, and the article, and to keep these filed for reference whenever additional amounts of that article are required. One will get better prices by following this method.

It is advisable to call for bids from out-of-town firms, but they should be required to make their bids f.o.b. the health officer's town, or else allowance must be made for freight, express or postage charges. Wherever the local merchants make a price equal to or lower than the outside bidders, they should be given the preference, and at times it is good policy to do so anyway, if the difference in price is only slightly in favor of the non-resident bidders.

*Accounting.*

Every health department should keep its own accounts, partly as a guide to enable the health officer to stay within his budget, or allotment of funds, and partly as a record for protection against charges of financial mismanagement. The accounts should show in some detail for what purposes money has been expended. A useful classification is:

A. Salaries and personal service.
B. Transportation expense.
C. Equipment.
D. Printing and publishing.
E. Postage.
F. Telephone and telegraph.
G. Express, freight and cartage.
H. Office supplies.
J. Laboratory supplies.
K. Books, pamphlets, posters, periodicals.
M. Films and lantern slides.
P. Vaccines and antitoxins.
S. Miscellaneous.

This list can be changed according to local conditions, but for the average health department it gives about as much detail as is of material value. In large health departments, it is usually advisable to classify expenditures by function (administration, food inspection, sanitation, communicable diseases, child hygiene, education, etc.), as well as by purpose.

In determining the accounts to be kept, someone with a thorough knowledge of accounting should advise the health officer in preparing the system, and in setting up the books. A looseleaf form is generally the most satisfactory. There is available a wide variety of stock sheets which will give almost any amount of detail required.

Every month the health officer should check up his accounts with those of the municipal or county auditor and should prepare a brief summary, showing the expenditures by purpose, for the month, and the total expenditures to date.

# CHAPTER V

## REGISTRATION OF BIRTHS AND DEATHS

The process of registration of births and deaths is one by means of which certain facts in regard to each birth and death in a population group are recorded. From these recorded facts, by compilation and analysis, we obtain the vital statistics which enable us to measure the health of a population group and various demographic data of value to the sanitarian, the economist and the statesman.

Birth and death registration is also of great importance from a legal standpoint. A birth record may be needed at some future time to

Prove citizenship
Prove right to vote
Prove school age
Prove age of consent
Prove legal age for marriage
Prove age under child labor laws
Prove age for military service
Prove right to hold public office
Prove right to property inherited
Prove nationality, in foreign countries
Prove qualification for jury service
Secure passports

A death record may be needed to
Establish property rights
Establish insurance claims

Establish pension claims
Establish legitimacy of children
Settle inheritance claims
Settle genealogical disputes

It is for these reasons that all birth and death certificates should be treated as *legal documents*; that every item should be faithfully and carefully filled out as far as possible; that full names, correctly spelled, should be given, and that only unfading ink should be used in their preparation.

Having considered the general aspects of vital statistics in another chapter, we shall here concern ourselves only with the salient points of the process of registration. It is in the careful observance of many details that success in registration lies, for statistics are of value only in so far as the fundamental facts on which they are based are complete and accurate. The procedures outlined in this chapter are based largely on the standards advocated by the Census Bureau.

The generally accepted method for registration of deaths is to require by law that no body may be buried, removed, or held more than a few hours pending final disposition, unless a permit therefor has been issued by the proper official. But, in order to obtain such permit, a death certificate must first be completely made out and presented to the official issuing the permit. Such an official is usually termed a "registrar," or "subregistrar." This simple procedure seems to cause considerable misunderstanding at first, wherever it has been introduced. Neither the public nor the registrars immediately comprehend the fundamental underlying purpose of the regulation. *This is simply to insure the filing of a complete death certificate for every death.* The means chosen as most effective is to make unlawful the disposal of a body without a burial permit, for which permit the filing of a death certificate is pre-requisite.

In order to make it entirely practicable for every death to be registered (and also every birth) provision is usually made for the establishment of subregistrars at points conveniently accessible to the general public. There should be a subregistrar in every school district or voting precinct outside of incorporated cities, towns, and villages, in order to make registration easily possible.

In obtaining the facts which are required in order to accomplish satisfactory registration, certain duties are placed upon the various persons concerned with the case. It is the duty of the *undertaker*, or other person disposing of the body, to obtain the personal items called for on the death certificate. These items relate to the place of residence, age, sex, color, marital condition, occupation, nativity and parentage of the deceased. These must be obtained from the person best qualified to give the information, usually a relative, and the information should be given over the signature of the informant.

The statement as to the date and cause of death is made by the *attending physician*, if any. Where the death occurs without medical attention, two procedures are available. If the death occurred under circumstances suggestive of foul play or suicide, an inquest must be held by a coroner or other officer acting as a coroner. In such case, the verdict of the coroner's jury is entered as the cause of death, and attested by the signature of the coroner or person acting as such. In case the death was apparently by natural causes, but without medical attendance, the health officer is sometimes required to investigate the facts, and to certify over his signature as health officer the probable cause of death. This duty may fall upon the county or city physician.

The *undertaker*, or person disposing of the body, after having obtained the personal particulars and entering the date and place of burial or removal, presents the certificate to the attending physician to enter the date and cause of death. With the certificate completed, he proceeds to the local registrar or sub-registrar and receives in return for the certificate a permit to bury, remove or otherwise dispose of the body.

It is entirely possibe for the registrar to keep a close check on the regular undertakers, and secure the filing of a death certificate for every case handled by them. Almost invariably the undertaker will do his best to comply with the regulations. But the difficult part of the problem is securing certificates for deaths occurring in isolated areas without a regular undertaker in charge. Registration of stillbirths as deaths is also sometimes difficult to secure.

There are several ways of seeing that the regulations are enforced, and a few suggestions are offered. The local papers usually report deaths, and a list of such deaths should be kept and used as a check. If the death certificate is not received, an investigation should be made promptly. A few judicious prosecutions in cases where the regulations are violated will have a very salutary effect.

Keeping track of the sale of caskets or coffins is another means of checking death returns. In some states every retail seller of caskets is required to enclose a blank death certificate and a notice giving the essentials of the law in each casket sold, and to make monthly reports of such sales to the state health department. By cooperation with the seller, these cases can be investigated promptly.

Although it is important that the registration regulations be thoroughly enforced, it will be found advisable to use discretion in some cases. There are instances in which a literal interpretation of the regulations would cause great difficulty without succeeding in getting better results than a more liberal interpretation would. It is sometimes advisable, for example, in very sparsely settled areas, to let a responsible undertaker proceed with a burial, provided he first notifies the registrar, under his promise to file the death certificate on his return. When a twenty to forty mile trip is involved, this is reasonable.

Birth registration presents in some ways more difficulties than death registration. At any rate, the death registration, as a rule, is more complete than birth registration. It is easily possible to prohibit a body being buried without a permit, but not to prohibit children from being born without a permit. Yet it is possible to get a high percentage of birth registration. Newspapers serve as one source of information. In rural districts, the local postmaster, or school teacher, if properly approached, will cooperate in advising the health officer or registrar as to recent births. Baptismal records in churches can usually be seen if the priest or clergyman is courteously requested for permission to do so. And finally, it is worth while, say once in two or three years, to make a house-to-house canvass of the registration district, listing every child under one year of age, and then checking these against the registered births.

Of course, every physician should be personally seen by the local registrar, and asked to cooperate in filing reports of births promptly. The physicians should be urged to carry blank birth certificates in their obstetrical bags, and to fill out the report before leaving the house in every confinement case. Particularly urge them *not to wait for the parents to decide on the name of the child.* The name can always be filed later, on a supplemental report of birth, but if the doctor waits for the name, he may forget to file the birth certificate.

Midwives should be personally instructed as to the regulations and in making out the certificates, and it is a good plan to look over their record books at irregular intervals, as a check on their reporting.

Every effort should be made to see that the public at large understands the principal requirements of the registration regulations. Notices in local papers, slides in motion picture shows, posters, etc., are useful for this purpose. And an occasional successful prosecution of a persistent violator, prominently reported in the local papers, is especially effective in helping to bring about complete registration of either births or deaths.

Complete birth registration is essential if the nurses of a health department are to be enabled to reach the mothers of young children and aid them to rear strong, healthy offspring. If the birth records are incomplete, the reduction of a high infant mortality is very difficult.

## CHAPTER VI

# VITAL STATISTICS

That "no health department, state or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring" is an axiom well known to all engaged in public health work. It is with such knowledge, gained from the collection and statistical study of reports of deaths and disease, as a guide, that the sanitarian lays his plans for the protection of the health of this community. It is through constant and careful study of these reports received from day to day that he keeps himself forewarned against impending epidemics. As one writer has said, "No lighthouse keeper on a rocky coast is charged with a greater responsibility than he who is set to watch for the signs of coming pestilence from the conning tower of the health department." And, lastly, it is through the use of his "vital statistics"—the "bookkeeping" of public health—that the health officer is able to check up the results of his efforts and show, in a tangible way, what has been accomplished in a given period.

Unfortunately the study of vital statistics has not proven generally popular, on account of the tendency on the part of most people, especially those who do not like mathematics, to regard all statistics as "dry" and uninteresting. Statistics appear dry to an individual because he fails to visualize the things for which they stand. He looks upon a statistical table as a mere collection of figures, which, taken alone, are meaningless, and, of course, uninteresting. If, in the study of statistics, one will bear in mind that the figures are not mere figures alone, but that they represent certain vital things or events, he need not find them uninteresting at all.

Another thing which has caused a lack of interest in statistics is the popular belief often expressed in the statement that "you can prove anything by figures". The fallacy of this belief may be easily seen on a moment's reflection. The statistical method consists simply in the expression of facts by figures, through mathematical processes. If the figures are so manipulated as to produce an erroneous result, such result is not a fact, and any conclusion based thereupon is obviously no more dependable than one drawn from any other kind of faulty evidence.

The health officer has also been handicapped in the obtaining of material for statistical purposes on account of the prevalence of the idea that the collection of records of births, deaths and disease is largely "red tape," carried out by the health department as a time-honored custom, and that the material is to be filed away or used only for the preparation of formal reports. It is the purpose of this chapter to point out briefly how these records may be used through the statistical method in a practical way.

There are two main sources of error to be guarded against in the making of vital statistics: the use of incomplete, inaccurate or improper data, and the employment of faulty methods in classification, compilation and analysis. It is for this reason that population enumeration, registration of births, deaths and marriages and the reporting of notifiable diseases should be complete; that the records should be completely and accurately filled out, and that the health officer who would work out dependable statistics should acquaint himself beforehand with the methods of procedure involved. This does not mean, however, that the local health officer must become a mathematical expert in order to be able to make practical use of his vital statistics. While many processes included in the statistical method involve elaborate and complicated mathematical procedures, practically all of the processes used in such statistical work as is within the limitations of the average small health department are quite simple and within the bounds of ordinary arithmetic. For a concise discussion of some of the more elaborate processes, the reader is referred to Whipple's splendid hand-book on "Vital Statistics."

Vital statistics commonly include births, deaths, marriages and morbidity, or cases of disease. In comparing the occurrence of these events in a given community, with that for another community, or for different periods of time, ratios to a given base, such as a unit of population, are used—that is, so many births per 1000 population, or so many deaths per 100,000, etc. These ratios are known as "rates," hence the terms "birth-rate," "death-rate" and so on. Since population is commonly used as a base for most birth, death, morbidity and marriage rates, it is essential that the health officer contemplating the preparation of vital statistics have an understanding of statistics of population. The reader will find the discussion of this subject by Trask, in his paper on "Vital Statistics, A Discussion of What They Are and Their Uses in Public Health Administration," quite useful in this connection.

## POPULATION

The population figures generally used by health authorities for statistical purposes are those of the U. S. Census Bureau. As the federal census is taken only every ten years, however, it is necessary to "estimate" the population of a given community for intercensal years. This may be done in two ways: by the arithmetical method, or by the geometrical method.

The arithmetical method is based on the assumption that the increase or decrease in population which took place between the last two census years was spread evenly over the ten year period, and that the same annual increase or decrease will continue for the years following. For example, a city in 1910 had a population of 3600, and in 1920 a population of 4800. The total increase was 1200, or 120 a year, between 1910 and 1920. Therefore, by the arithmetical method, the estimated population for 1921 would be 4920—4800 in 1920, plus an increase of 120 for the following year. The geometrical method consists in the use of the mathematical principle involved in the calculation of compound interest; that is, the increase of population for a given year may be determined by multiplying the yearly percentage of increase into the sum of the population at the *beginning* of the preceding year and the *increase* for that preceding year.

Where the increase in population depends largely upon the excess of births over deaths, the geometrical method is the more accurate. The arithmetical method is more applicable when the increase is due to immigration. The arithmetical method has the advantage of being more simple and is the one most generally used in the United States. Where it is desired to determine which is the more accurate for use in a given community, one may take the last two intercensal periods and, by working out the rate of increase by both methods for the first period, determine which was more accurate in estimating the increase for the second.

## BIRTH STATISTICS

While birth statistics alone have only a casual interest to the health officer, they are valuable to the community as a whole in enabling it to determine its natural increase or decrease in population through the excess of births over deaths, or vice versa. Birth *records* are of importance, however, to the health officer in many ways, as will be shown in another chapter. The principal interest of the health officer in birth *statistics* is in the computing of the infant mortality rate, which is based upon births, instead of population.

Birth-rates may be based upon population or on number of women of child-bearing age. The rate based upon population is the one generally used for comparison of one community with another, or of one year against another in the same community. The unit of population for this rate is 1000; that is, the birth-rate represents so many births per thousand inhabitants. The rate is determined, therefore, by dividing the number of births for the period of time selected (usually a year) by the number of thousands of inhabitants. For example, a city with a population of 4000 had 100 births in the year 1919. Dividing 100 by 4, we get 25, which represents the birth-rate for that year.

To illustrate how birth-rates may be used for comparison, the following tables are shown:

TABLE II—BIRTH RATES OF FIVE CITIES FOR A GIVEN YEAR

| City | Births per 1000 population |
|---|---|
| *A* | 30.1 |
| *B* | 27.5 |
| *C* | 25.0 |
| *D* | 23.4 |
| *E* | 22.3 |

TABLE III—BIRTH RATES OF A CITY FOR FIVE YEARS

| Year | Births per 1000 population |
|---|---|
| 1916 | 27.5 |
| 1917 | 27.0 |
| 1918 | 26.4 |
| 1919 | 25.2 |
| 1920 | 27.6 |

By means of Table II, the birth-rates for City *A* are compared with those of Cities *B*, *C*, *D*, and *E* for a given period. In Table III, the birth rates for a given city are compared over a period of five years.

One important point to be remembered in computing birth rates is that stillbirths are not counted as either births or deaths for statistical purposes.

## DEATH STATISTICS

Death or mortality statistics, like birth statistics, are of value to the community because of their relation to population growth. To the health officer they are of special interest, because of their value in showing the losses to his community from disease, thus enabling him to create public interest in health protective measures, and because of the means which they present for measuring the results of public health work, by showing the saving in human lives accomplished from year to year. The following tables illustrate how mortality statistics may be used in this connection:

Table IV

| Year | Death rate City *A* | Death rate, Registration Cities, U. S. |
|---|---|---|
| 1912 | 20.0 | 15.0 |
| 1913 | 19.6 | 15.2 |
| 1914 | 19.7 | 14.7 |
| 1915 | 20.5 | 14.5 |

Table V

| Year | Death rate City *B* |
|---|---|
| 1905 | 22.0 |
| 1910 | 20.2 |
| 1915 | 17.2 |
| 1920 | 15.0 |

In Table IV, the death-rate for City *A* is compared with that for all Registration Cities in the United States, showing the excess of loss of human life in City *A* over the average loss in other cities. We note that in 1912, City *A* had an excess of 5 deaths per thousand; if this city had a population of 10,000, this means that the total excess in deaths was 50. The value of the average human life to the community is estimated roughly at $2000.00. It can therefore be shown that this excess of 50 deaths cost the community $100,000—several times the expense required for the maintenance of an adequate health department.

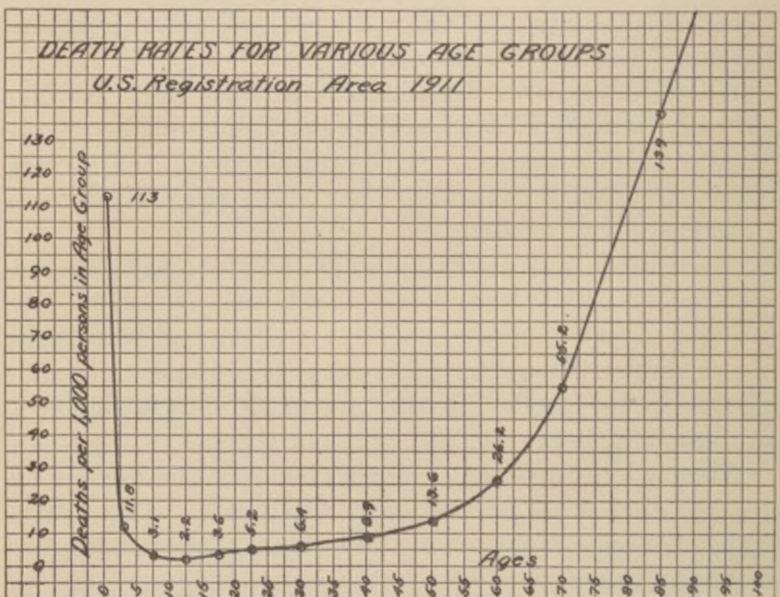
In Table V, the reduction of the death-rate for City *B* over a period of 15 years is shown. In this way it is possible for the health officer actually to see the results of his work for this period, provided the various factors affecting the death-rate are duly evaluated.

Where dependable case reporting has been lacking, mortality statistics have been used as indices of the prevalence of certain diseases. The variable case fatality rates often encountered, however, make this source of information generally unreliable.

Death-rates, with the exception of rates for single diseases, are usually based upon a population unit of 1000. For example, a city of 10,000 inhabitants which had 150 deaths in a given year, would have a death rate of 15 per thousand. The rates for single diseases are usually based upon a population unit of 100,000, to avoid the use of fractions.

What is known as the *crude* death-rate is the ratio of all deaths to the total population in thousands. This rate is applicable for comparison of the mortality for communities having populations of similar make-up as regards age, sex and race, but its use where the communities are not similar in these respects will lead to wrong conclusions. To overcome this source of error, we have what are known as *specific* death rates, and *standardized* or *corrected* rates. For a detailed explanation of these rates the reader is referred to Whipple's book on "Vital Statistics." Briefly, a *standardized* death rate is that rate which is obtained when the actual deaths in the actual population are computed by special rates for the various age groups of that population, and then those special rates applied to age groups of a population of standard age distribution. The summation of the latter figures, divided by the total population in question, gives a standardized death rate, by means of which death rates in non-comparable populations may be compared with each other.

*Diagram No. 1.*




Migration, the birth-rate, marital condition of inhabitants and deaths of non-residents all affect the death-rate of a community. It is a common practice to exclude deaths of non-residents. As there is usually no means of including, in computing the death-rate for a registration district, deaths of residents which occurred outside such district, the exclusion of non-resident deaths is an improper practice, especially in small districts. It is only admissable when the gross deaths and death-rate are exhibited first; then there is given a statement of what constitutes residence and non-residence (the most satisfactory definition is that period required by statute to entitle a citizen to vote); the fact that deaths of residents occurring outside the registration district are not included; the number of deaths excluded as non-resident under the classification adopted, and, finally, the net deaths and net death rate are stated.

The infant mortality rate is discussed to some extent in another chapter. This rate (representing the mortality of infants under one year of age), is based upon living *births* instead of population, the unit being 1000. The reason for this is the great difficulty encountered in the census enumeration of infants, especially as to age, which makes a population unit unsafe for use as a base. As an illustration of the method of determining the infant mortality rate, suppose we have a city in which 500 live births occurred in a given year, and in which there were 60 deaths among infants under one year of age. Since there were 60 deaths to 500 births, there would have been 120 deaths for 1000 births; the infant mortality rate is therefore 120. Another means of comparison sometimes used in connection with mortality among children is that of separating out the deaths from diarrhea and enteritis among infants under two years of age.

An important development of the use of mortality statistics has been the *life table* from which the expectancy of life at a given age may be obtained. As an indication of the progress which has been made in the conservation of human life within the past 40 years, it is interesting to note that the expectation of life has increased materially, especially in the lower age groups, during this period of time.

## MORBIDITY STATISTICS

The principal interest of the health officer in morbidity statistics lies in their usefulness in showing the prevalence of disease in his community, through which he is enabled to plan his work and to keep watch for outbreaks. Through the daily use of his morbidity reports, he is also able to institute proper control measures for each case *as it occurs*. The necessity for prompt and complete reporting is therefore obvious.

Since a large proportion of cases of notifiable diseases are never seen by a physician, the health officer, in order to obtain reporting sufficiently complete to give him dependable information as to the true prevalence of disease in his community, must make every effort, through educational measures, toward developing the habit of voluntary reporting on the part of the general public. As one writer has expressed it, "The requirements for notification of the preventable diseases and the extent of their enforcement may be taken as an index of the intelligence and efficiency of health administration in a community."

As to the practicing physician and the reporting of notifiable diseases, one cannot do better than quote the words of Trask, in his paper previously referred to, "The physician is the one, who because of the very nature of his work and his relation to the community, is best able to have this information and furnish it. He comes in contact with the sick to a degree others do not.

"Unfortunately many practicing physicians have little knowledge of the methods of health administration and in common with people in general frequently expect the health department in some mysterious manner to control disease without placing upon them the burden and privilege of cooperating by the notification of the occurrence of cases. The practicing physician, whether he recognizes it or not, or is so recognized by the community, is essentially an adjunct of the health department, for unless he performs his part, the health department is in a large measure helpless.

"Among practicing physicians, at least in the United States, there has at times been the feeling that the knowledge of a disease in a patient is privileged information which they should not be called upon to impart. In communities where the laws require the notification of disease this feeling has no legal basis and the physician who does not make reports is not a law-abiding citizen. But aside from the legal aspects of the matter there would seem to be little justification for such a course. Every physician has a number of individuals or families who look to him, and properly so, not only for treatment, but also for such reasonable protection from disease as he is able to give. The failure to report the occurrence of a case of communicable disease in one patient may lead to its spread to others among his clientele whose rights he has ignored. He therefore violates the intent and spirit of the ethical principle of the protection of patients among whom must be considered the well together with the sick. The notification of disease is in the interests and for the protection of the community, and as his patients are usually members of the community their interests are ignored and because of the anti-social whim or supposed convenience of the individual affected with a notifiable disease they are deprived of the protection they have a right to expect. It would seem that the physician who fails to report his cases of preventable diseases required to be notified may properly be considered as actively obstructing public health administration."

The reporting of certain preventable diseases may be greatly facilitated indirectly by the use of the diagnostic laboratory.

For comparison, morbidity statistics, like death statistics, may be expressed as "*crude*" rates, or as "*specific*" rates. The crude rate expresses the ratio of cases of a given disease occurring during a given year, to a population unit of 1000, 10,000 or 100,000. The larger units are sometimes used to avoid fractions. The specific rate, usually based on a unit of 1000, shows the incidence of disease by age groups, sex, occupation and so on. In determining what is known as the "case fatality rate," the ratio of the number of deaths from a certain disease to 100 cases is commonly used; in other words, the mortality is expressed in percentage.

An example of the use of morbidity statistics for comparison is given in the following table:

TABLE VI

| City | Population | Number cases | Case rate per 1000 population | Number deaths | Case fatality rate |
|---|---|---|---|---|---|
| *A* | 10,000 | 100 | 10.0 | 20 | 20.0 |
| *B* | 20,000 | 400 | 20.0 | 20 | 5.0 |

## MARRIAGE STATISTICS

Marriage statistics, compiled from records obtained through the registration of marriages in much the same manner as births and deaths are registered, have their greatest usefulness in the furnishing of information relative to social life, and the growth of population through births. For example, the number of married women of child-bearing age, in a community, is a determining factor in the birth-rate and may explain a difference between the birth-rates of two communities of equal population. In addition, the records are of legal value as evidences of legitimacy of children and the dower rights of women.

The marriage rate is commonly based upon population, the unit for the ratio being 1000, as in the case of births and deaths.

It is hoped that the foregoing has given to the health officer an insight into the uses of vital statistics and some of the more common processes in their preparation. As Whipple has said, "Many of you have been in office a long time; you have forgotten most of your arithmetic—not to mention algebra. You can see the new era coming, and you dread the new methods founded on accurate statistical studies of accident, disease and death. There is no need of this fear You can use statistics as well as anyone, but you must study."

## CHAPTER VII

# HEREDITY AND PUBLIC HEALTH

The subject of heredity is one of the least understood, and yet probably one of the most important, of all of the factors involved in public health work. There has seemed to be on the part of health officials a tendency to avoid consideration of hereditary factors in public health. Yet it appears that only on the basis of heredity can we account for some of the facts in public health, and it seems probable that if we can utilize more effectively some genetic principles, we may be able to do more effective public health work.

Let us take for first consideration the question of longevity. A mass of data has been accumulated by the Genealogical Record Office, by Karl Pearson and Mary Beeton, and by A. Ploetz. In figures given by the Eugenics Record Office covering 340 families in which the father or uncle lived to 90 years or more, there was a total of 2259 children, of whom 119 died before the fifth year of life. This would give an infant death rate of 53 per 1000 for the first four years of life, as compared with 400 for the Registration Area in 1880. In commenting on this astonishing figure, Popenoe and Johnson state, "If any city could bring the deaths of babies during their first twelve months down to 53 per 1000, it would think it had accomplished the impossible; but here is a population in which 53 per 1000 covers the deaths, not only in the fatal first twelve months, but of the following three years in addition. Now this population with an unprecedentedly low rate of child mortality is not one which had had the benefit of any Baby

Saving Campaign, nor even the knowledge of modern science. Its mothers were mostly poor, many of them ignorant. They lived frequently under conditions of hardship; they were peasants and pioneers. Their babies grew up without doctors, without pasteurized milk, without ice, without many sanitary precautions, usually on rough food. But they had one advantage which no amount of applied science can give after birth—namely, good heredity. They had inherited exceptionally good constitutions." Beeton and Pearson have found that the children of parents who died young have a higher infant death rate than the children of parents who are long-lived. In studying the daughters of mothers, they found that where the mothers died under 38 years of age, 52 per cent. of their daughters died in infancy, while for those mothers who lived to 84 or more, only 10.5 per cent. of the daughters died, the percentage diminishing steadily as the age-at-death of the mothers increased. A similar relation was found for the daughters grouped by the father's age-at-death. Ploetz, in a study of child mortality in relation to the age-at-death of the father, in various royal and princely families, found that the percentage of children who died was greatest in the group where the father died young, and least where the father died at an advanced age.

These facts are not only interesting in themselves, but are especially so in connection with recent statements and statistics prepared by the U. S. Children's Bureau. This Bureau has presented a chart showing that infant mortality is highest in families in which the father's wage is lowest. They say, "As the father's income goes up, the infant death rate goes down," and imply that poverty is the important cause of infant mortality.

These two groups of data, therefore, seem to disagree. It is not our purpose to enter into an analysis of the matter, as it would involve us at great length in a controversial question presenting many difficulties. Probably back of poverty lie certain hereditary factors which have not been wholly taken into account by the Children's Bureau. It would seem that both heredity and environment enter into the problem of infant mortality, and that we shall not be able to obtain the most effective preventive measures against it, unless we learn what these hereditary factors are and try to turn them toward the prevention of infant deaths.

There is another interesting side light on the question of longevity and heredity. There are marked differences in death rates between various races and nationalities, which perhaps may be partly accounted for by different environmental conditions, but probably also are dependent in considerable degree on certain hereditary characteristics of the racial stock. This is indicated by the fact that there is a materially lower death rate among whites than among negroes, both living under the same general environment in this country, and by the fact shown in statistics gathered by the U. S. Children's Bureau that there are material differences in the infant mortality rates of various nationalities living under the same environmental conditions.

Turning now to the question of the relation of heredity to resistance to disease, we find a number of facts of striking interest to the health officer. There seems to be valid evidence that man in his experience with disease undergoes an evolution in which the non-resistant strains are killed off, gradually leaving only those stocks which are more or less immune. A study of some English statistics will show this evolution at work. We select English figures because they have had excellent death registration running back for several generations. Typhus fever is a good example.

This disease was a terrible scourge in past times, but is now seldom met with in more advanced countries. The deaths from typhus in England and Wales are as follows (as given by Brend):

TABLE VII

| | | | |
|---|---|---|---|
| 1869 | 4281 | 1876 to 1880 | 887 |
| 1870 | 3297 | 1881 to 1885 | 603 |
| 1871 | 2754 | 1886 to 1890 | 181 |
| 1872 | 1864 | 1891 to 1895 | 106 |
| 1873 | 1838 | 1896 to 1898 | 56 |
| 1874 | 1762 | 1899 to 1906 | 39 |
| 1875 | 1499 | 1907 to 1914 | 11 |

The role of the louse in the transmission of typhus was not discovered until 1909, and even today bodily lousiness is quite prevalent in many quarters, yet typhus has almost vanished in England.

For another example, take the case fatality rate in scarlet fever, expressed in percentages of deaths as compared with cases. The data are from the Metropolitan Asylum Board Records in England (Brend):

TABLE VIII

| | | | | | |
|---|---|---|---|---|---|
| 1875-79 | 13.5 | 1886 | 9.0 | 1893 | 6.1 |
| 1880 | 12.3 | 1887 | 9.5 | 1894 | 5.9 |
| 1881 | 11.1 | 1888 | 9.9 | 1895 | 5.4 |
| 1882 | 10.4 | 1889 | 8.9 | 1896 | 4.3 |
| 1883 | 12.4 | 1890 | 7.9 | 1897 | 4.1 |
| 1884 | 12.3 | 1891 | 6.7 | 1898 | 4.1 |
| 1885 | 9.5 | 1892 | 7.3 | 1899 | 2.6 |

| | | | |
|---|---|---|---|
| 1900 | 3.0 | 1908 | 2.6 |
| 1901 | 3.8 | 1909 | 2.3 |
| 1902 | 3.4 | 1910 | 2.3 |
| 1903 | 3.1 | 1911 | 1.9 |
| 1904 | 3.4 | 1912 | 1.6 |
| 1905 | 3.3 | 1913 | 1.2 |
| 1906 | 2.9 | 1914 | 1.2 |
| 1907 | 2.8 | | |

Concurrently with this decrease in the case fatality rate, the death-rate from scarlet fever declined from about 96 per 100,000 in 1866–1870 to 6.3 in 1910–1914. There has been no specific remedy found for scarlet fever, such as antitoxin, and there has been practically no change in the management of the disease, so that this considerable decrease in its fatality must be due to something else. It seems most probable that this something else is the elimination of the non-resistant strains, leaving us a stock which has undergone an evolution by natural selection against the disease. The only other explanation that is immediately apparent as a possibility is that the infecting organisms may be suffering a retrograde evolutionary process.

The same thing seems to be true to a considerable extent of tuberculosis. The decline in the tuberculosis death rate began long before its germ was demonstrated, and the rate of decline was almost as great before as since modern control measures were instituted. There was a marked reduction in the tuberculosis death rate of Edinburgh following the introduction of a dispensary system, but in the same period the death rate in Aberdeen, without a dispensary system, fell more rapidly. Pearson says, "It seems to me that when we study the statistics of the fall of the phthisis death rate, when we notice this fall taking place in urban and rural districts, when we see that it started long before the introduction of sanitorium and dispensary work, and that it has not been accelerated by modern increase of medical knowledge, then we are compelled to regard that fall as part of the natural history of man rather than as a product of his attempt to better environment."

There are other diseases which have either been practically eliminated or have suffered a decline in virulence, apparently with little reference to man's attempt to bring this about. Leprosy is of course an example. Syphilis today is not the acute disease it once was.

But if there is evidence that a continued racial experience with a disease tends to select that race on the basis of the survival of resistant stocks, there is also another side of the picture. What about the aboriginal stocks in contact with the white man's diseases? What about the white races in contact with unfamiliar tropical diseases? If heredity, that is racial experience with and selection against a disease, is a real factor in its prevalence and virulence, we should expect that racial stocks in contact with a strange disease would exhibit especially high death rates. And that is exactly what happens. There is nothing mysterious about the disappearance of the American Indians. They died because of inability to resist the white man's diseases, rather than from wars or civilization. Tuberculosis is more prevalent among the negroes in the United States than the whites (432 to 170 in Registration Area in 1910). Wherever tuberculosis has encountered the colored races in Africa, in the South Pacific Islands, in Tasmania, it has been an acute and rapidly fatal disease. Even whole peoples have been wiped out, and entire districts depopulated, by the white man's diseases, diseases to which the white man has become racially rather resistant by centuries of experience, but against which the aborigines had no protection of racial tolerance. The white man entering tropical countries finds himself severely attacked by diseases to which the native races are more or less tolerant, such as malaria, yellow fever, and the relapsing fevers. Now that we know the modes of transmission of these diseases, we are making it possible for the white man to live in and to develop the tropics, but we have not so far been able artificially to develop his resistance to such diseases. (Note: Noguchi's yellow fever vaccine is now being tried out extensively and gives great promise.)

In a number of diseases sanitation and medicine have accomplished marked results. The reduction of typhoid may be safely attributed in great part to safer water supplies and better sewage disposal. The reduction of diphtheria through antitoxin is a triumph of applied bacteriology and immunology. By applying hard-won scientific knowledge, we are now in a position to wipe out malaria and yellow fever, and can control, or practically eliminate, many other diseases. We have become able so to effect our environment as to triumph over unfavorable outward conditions of life, but have become so absorbed in this work as to have neglected the important field of heredity. Our health problem in respect of many communicable diseases is really to study the methods of nature in combatting such diseases and then to aid and accelerate the process. For example, now that we know the means of spread of yellow fever, we can accomplish in a few years what it would take nature perhaps centuries to do.

There is much to be learned about heredity, and much which can be learned which will be of great help in formulating rational health procedures. As yet our knowledge is meager, but it is being extended. Perhaps in a few generations we shall see radical changes in our methods as a result of a better understanding of the laws of heredity, and the adaptation of these laws to the problems of public health. We shall continue and intensify our attack on unfavorable environmental conditions, which has already produced signal results, but we shall also work with the hereditary factors and probably achieve an even greater success in promoting the public health.

An important contribution to this subject has recently been made by Raymond Pearl in "The Biology of Death." Every health officer should own this book and digest it thoroughly.

## CHAPTER VIII

## THE PROBLEM OF MATERNAL MORTALITY

Recent investigations by the Federal Children's Bureau have developed some interesting facts in regard to the great lack of adequate prenatal and obstetrical care. These conditions seem to be more acute in the rural districts than in the cities, on account of the isolation and distance from skilled medical attendance, but even in cities their importance is apparently insufficiently appreciated.

Too frequently, the physician, if called at all, is summoned at the last moment. No pelvic measurements, urine analyses, blood pressure readings, or other measurements and examinations have been made. He has nothing to guide him and must meet the situation as best he can. Obviously, under such circumstances, it is impossible for the physician to give the best attendance of which he may be capable, or to avoid unforseen complications, such as eclampsia. On the other hand, if all pregnancies were attended by careful physicians for several months, prior to confinement, many dangers might be eliminated or reduced and the woman, by hygienic supervision, placed in better physical condition to give birth to a normal, healthy child.

As yet, a very considerable number of women, especially among the foreign born groups, do not call physicians, but employ midwives. These midwives are very seldom indeed trained in their work and are often dirty, ignorant and careless. In fact, we may say that they are universally so, unless under the supervision of the State. There has been much discussion of the problem of the midwife in recent years, some arguing for her abolition and others for her regulation and training. At the present time, abolition seems impracticable, if not impossible, and the best solution seems to be to place the midwife under state supervision and regulation and to establish minimum standards to which she must conform in her practice.

These standards are enforced by public health nurses or medical inspectors. New York and New Jersey, in particular, have made notable progress along such lines.

There is also a considerable number of births that receive practically no attendance, except that given by the father or by neighbor women. In the isolated rural districts this is far more often the case than in the towns.

Very little information is available in respect of the causes of stillbirths, but there is little question that better prenatal and obstetrical care, with more adequate measures for the control of syphilis, will reduce their number. This is a problem which should be more thoroughly investigated.

The fundamentals for better prenatal care seem to be the following:

1. Educational activities to acquaint all women with the importance of early and continuous medical attendance during pregnancy and at confinement.

2. A campaign among physicians to raise the standards of prenatal care. Too much of this work is perfunctorily performed and insufficient tests and measurements are made.

3. Legal authority should be given for the supervision and regulation of midwives by the state. This should be made effective by means of medical inspectors and supervisory nurses.

4. Provisions should be made so that no woman, by reason of poverty or isolation, is compelled to do without adequate prenatal or obstetrical care.

Apparently we have made no progress in reducing maternal mortality, as the following tables show:

TABLE IX—DEATH RATE OF MOTHERS PER THOUSAND BIRTHS
(From American Child Health Association, 1923)

| Country | Rate per 1000 births | Country | Rate per 1000 births |
|---|---|---|---|
| Denmark | 2.4 | Germany | 4.9 |
| The Netherlands | 2.4 | Australia | 5.0 |
| Sweden | 2.5 | New Zealand | 5.1 |
| Italy | 3.0 | Spain | 5.2 |
| Norway | 3.0 | Ireland | 5.5 |
| Uruguay | 3.4 | Switzerland | 5.5 |
| Japan | 3.8 | France | 5.7 |
| England and Wales | 3.9 | Scotland | 6.2 |
| Hungary | 4.0 | United States | 6.8 |
| Finland | 4.4 | | |

TABLE IX*a*—MATERNAL MORTALITY U. S. REGISTRATION AREA

| Year | Death rate per 100,000 | |
|---|---|---|
| | The puerperal state | Puerperal septicaemia |
| 1910 | 15.7 | 7.2 |
| 1911 | 16.0 | 7.4 |
| 1912 | 15.0 | 6.5 |
| 1913 | 15.8 | 7.2 |
| 1914 | 16.0 | 7.1 |
| 1915 | 15.2 | 6.3 |
| 1916 | 16.3 | 6.8 |
| 1917 | 16.6 | 7.0 |
| 1918 | 22.2 | 6.5 |
| 1919 | 17.0 | 5.8 |

Whether the reduction in puerperal septicaemia since 1917 is a definite downward trend, or merely a temporary fluctuation, cannot be determined until official figures are available, but there is hope that the greater attention focused on this problem in recent years may make it possible to hold this gain and possibly improve on it. At any rate, a beginning has been made, on a national scale, in attacking the entire problem of maternal and infant mortality.

## CHAPTER IX

# MEASURES FOR THE PREVENTION OF MATERNAL AND INFANT MORTALITY

Years of agitation and propaganda have finally succeeded in forcing the passage by Congress, in 1922, of the Sheppard-Towner Bill giving federal aid to the several states in providing for better care of maternity and infancy. Originally conceived on broader lines, the bill was cut down until, as finally passed, it provided for but little beside educational measures. This much, however, if intelligently directed, cannot fail to have a marked and cumulative effect, for in the education of mothers we have one of the strongest weapons with which to reduce a high infant and maternal mortality.

Continuous, unceasing, well-directed education on the hygiene of maternity and infancy is the one measure which is always applicable, always useful, and available under all conditions. The form of this education can and must be varied according to the character of the locality and of the people to be reached, but in some form it can always be used. Some of the methods are:

(*a*) Distribution of printed or mimeographed advice and instructions, in the language of the group to be reached. Obviously this can only be used among the literate. A number of states and cities make a practice of sending printed matter to the mother of every child whose birth is recorded, as well as using other channels of distribution, such as women's clubs.

(*b*) Newspaper publicity and press articles.

(*c*) Newspaper and outdoor advertising. This is effective if well done, but seldom used on account of the cost.

(*d*) Visual education by means of motion pictures and lantern slides. This is no longer limited to towns and cities, as portable motion picture projectors and stereopticons are available, which can be operated on storage batteries, and so carried to remote rural districts by automobile.

(*e*) Demonstrations in classes by public health nurses.

(*f*) Individual home visits and demonstrations by public health nurses.

The care of the child should begin before birth, and for that reason prenatal work should be an integral part of the health department's child hygiene program. In cities prenatal clinics can be organized, to which the public health nurses can bring cases for examination and instruction. In the rural districts, however, reliance must be placed primarily on the nurse, who will locate the prenatal cases and advise them as to the hygiene of pregnancy and the preparations necessary for confinement. She will also endeavor to have the proper examinations, measurements and analyses made by the attending physician, if one is available, or by the county health officer.

The problem of adequate care at, and subsequent to, childbirth, in the rural districts, especially in the western states where distances to a physician are often great, is a difficult one indeed. Part of the difficulty can be overcome if adequate prenatal instruction has been given, so that the necessary preparations are made. In many of the isolated communities there are not even regular midwives available, but the obstetrical work is done by neighbor women. If the public health nurse can teach these women in classes, as is being successfully done in some places, a great deal can be accomplished. At least some of the danger of puerperal septicaemia can be avoided; the imperative need of medical assistance, no matter what the distance or cost, in abnormal cases, can be made known; arrangements made for the use of an ophthalmia prophylactic, and some kind of sterile dressings for cord and perineum demonstrated.

After birth, the public health nurse can follow-up the infant's progress, aiding the mother with instruction and advice as to the child's care. In towns and villages well-baby clinics, held at definite times, can be organized, so as to obtain this result with a minimum expenditure of time on the part of the nurse and health officer.

A particularly fruitful field is the organization and instruction of "Little Mother's Classes" among young girls, especially those who assist their parents in the care of the younger children of the family. The instruction in such classes begins with the care of the baby, and can be extended to the instruction of the older girls in the hygiene of pregnancy, and under favorable conditions, in sex hygiene. Home economics classes in the public schools frequently offer good opportunities for such teaching.

The health department's work in improving the milk supply is a decided factor in infant hygiene. After the infant is weaned, probably diet is the most important single factor in its welfare. If a safe, clean milk supply, of low bacterial count, is available, an important step in the reduction of infant mortality has been taken. It must be backed up, to be effective, by adequate instruction of the mother, preferably by the family physician, as to the proper diet for the infant. If no physician is available, the health officer, or public health nurse, should give careful feeding directions.

Sanitation also plays a part. Mothers should be instructed as to the necessity for clean surroundings, for the reduction of flies through elimination of their breeding places and of the places from which they can derive infection, and as to proper ventilation. They should also be impressed with the need for proper care of soiled diapers, as this has been shown to be a potent factor in summer diarrheas. Levy, of Richmond, Va., produced a further reduction in infant mortality by this one procedure alone. In towns and villages health departments can take more or less direct action to bring about better sanitation. In the rural districts, however, education and persuasion are usually the only means available to improve sanitation.

The health department should know, and keep in touch with, the various social and philanthropic agencies, such as hospitals, foundling and orphan homes, day nurseries, Associated Charities, Red Cross, Salvation Army, clinics, and all other organizations which can in any way handle or assist the abnormal cases which come to its attention. It is often the case that one of these agencies can solve a special problem that is outside the purview of the health department, and which it is not equipped to handle. By coordinating all such agencies with the health department, children's lives may often be saved, or their health protected from impairment.

A list of all the social and philanthropic organizations within his jurisdiction, with full data as to the type of work they do, their resources and personnel, should be in the possession of every health officer, and he should be personally acquainted with at least the executive officer of each one.

## CHAPTER X

### INFANT HYGIENE

Many are the platitudes expressed by various writers regarding the value of infant hygiene work to society. These are indications of the great importance of the subject. But from the standpoint of efficiency in public health procedure too few health officers even now realize that the employment of measures for the improvement of infant hygiene represents perhaps the quickest, most direct and most effective means of reducing the general death-rate of a community or a nation. The opportunity which exists may be seen by examining the death-rates and causes of death for the different age groups. The figures for the U. S. Registration Area, for 1911 and 1920 (two years of or near census years, so that the age groups are fairly exact) are as shown in Table X.

The age groups which show the highest mortalities are seen to be those at either end of the span of life. A moment's reflection will show that it will be a long, slow process to reduce the death rates in the highest age groups (over 45), as both the hereditary and environmental factors which affect these rates have largely become past history for such age groups, and are beyond our power to modify greatly. Whatever we may now do to affect such factors in the lower age groups will not be expressed in lower death rates in the higher age groups for many years, perhaps for a generation or more. In the age groups 10–35, the death rates are already very low, and it would obviously be somewhat ineffective to direct our greatest efforts at a point

Table X—Age Group Death Rates

| Age | Deaths per 1000 of stated age | |
|---|---|---|
| | 1911 | 1920 |
| Under one year | 112.9 | 96.7 |
| 2–4 | 11.8 | 6.5 |
| 5–9 | 3.1 | 3.0 |
| 10–14 | 2.2 | 2.3 |
| 15–19 | 3.6 | 4.1 |
| 20–24 | 5.2 | 5.7 |
| 25–34 | 6.4 | 6.9 |
| 35–44 | 8.9 | 8.3 |
| 45–54 | 13.6 | 12.2 |
| 55–64 | 26.2 | 23.9 |
| 65–74 | 55.2 | 52.7 |
| 75–84 | ..... | 117.4 |
| 85–94 | 138.9 | 237.0 |
| 95 and over | ..... | 331.5 |

(See also Diagram No. 1.)

where, naturally, the lowest mortality occurs. Therefore, by elimination, we turn to the earliest ages of life as the logical point at which to apply our greatest energies.

An examination of the causes of death in the early age groups will throw further light on the subject, using again the figures for the U. S. Registration Area for 1911 and 1920.

In the first three groups, Diarrhea & Enteritis, Diseases of the Respiratory System, and Communicable Diseases, *a priori* reasoning and practical experience indicate that material results may be obtained by a reasonable effort and expenditure. For these affections are to a considerable extent the result of environmental, rather than hereditary, factors, and so are more easily within our power to modify favorably.

TABLE XI—PER CENT OF DEATHS UNDER ONE YEAR OF AGE FOR VARIOUS CAUSES
U. S. Registration Area

| Cause of death | 1911 | | 1920 | |
|---|---|---|---|---|
| | % | % | % | % |
| 1. Diseases of the digestive system | .... | 28.6 | .... | 20.1 |
| (*a*) Diarrhea and enteritis | 25.2 | .... | 17.6 | |
| (*b*) Other diseases of the digestive system | 3.4 | .... | 2.5 | |
| 2. Diseases of the Respiratory System | .... | 15.1 | ... | 15.5 |
| (*a*) Broncho pneumonia | 7.1 | .... | 9.2 | |
| (*b*) Pneumonia | 4.9 | .... | 3.8 | |
| (*c*) Acute bronchitis | 2.4 | .... | 2.0 | |
| (*d*) Other respiratory diseases | 0.7 | .... | 0.5 | |
| 3. Communicable diseases | .... | 9.4 | .... | 12.5 |
| (*a*) Whooping cough | 2.5 | .... | 3.5 | |
| (*b*) Tuberculosis (all forms) | 1.7 | .... | 1.2 | |
| (*c*) Syphilis | 1.2 | .... | 1.1 | |
| (*d*) Measles | 0.9 | .... | 1.1 | |
| (*e*) Diphtheria | 0.6 | .... | 0.5 | |
| (*f*) All other communicable diseases | 2.5 | .... | 5.2 | |
| 4. Diseases of early infancy | .... | 36.6 | .... | 42.0 |
| (*a*) Premature birth | 15.8 | .... | 22.0 | |
| (*b*) Congenital debility | 10.0 | .... | 5.4 | |
| (*c*) Malformations | 5.3 | .... | 7.1 | |
| 5. Other miscellaneous causes | .... | 10.3 | .... | 9.9 |
| Total | .... | 100.0 | .... | 100.0 |

(NOTE: Stillbirths not included in this Table.)

Diarrhea & Enteritis, for example, in general may be prevented, or their incidence much reduced, by attack along the two main lines of improvement in infant feeding and sanitation. In the first line of attack we may (*a*) substitute proper for improper food; (*b*) improve the quality of food, and (*c*) improve its home preparation and regimen. (*a*) and (*c*) are largely matters of education of mothers as to what is the proper diet for infants, while (*b*) is to a considerable extent a function of the milk and food inspection divisions of health departments. Under (*a*) the encouragement of breast feeding is of importance, as available statistics indicate that a breast-fed baby has several chances to live as compared with the one of a bottle-fed baby. In the second line of attack, sanitation, measures for the reduction of flies and sanitary excreta disposal are demanded, as there seems to be little doubt that many intestinal disorders are transmitted by flies, where conditions are insanitary. An important detail, as has been shown by Levy in Richmond, Virginia, is the proper care of diapers, to prevent access by flies to fresh infective material.

Under Diseases of the Respiratory System, possibly a part of the reported pneumonia and broncho pneumonia is really secondary to infections such as measles and whooping cough, and is not properly classified owing to the failure of the attending physician to enter the primary cause of death on the certificate of death. But aside from such cases there is reason to believe that much of the pneumonia could be prevented by hygienic measures. It would seem entirely possible, by means of education of mothers in hygiene; by increasing the vital resistance of infants; by reducing overcrowding, and by better care during and after acute contagious diseases, to cut down materially the death rates from these causes.

Of the Communicable Diseases, whooping cough is the great baby killer, followed by tuberculosis (all forms), and syphilis. We are gradually developing more effective measures against syphilis. There is hope that some day the really effective measures against tuberculosis (reduction of propagation of the non-resistant stocks, and protection of infants and young children from infection by tubercular adult relatives and friends, and by milk from tubercular cows) will be made an effective part of the anti-tuberculosis campaign. But against whooping cough we have made no progress, to our great discredit. The public still says "It is only whooping cough." Long ago we should have instilled in the public mind a wholesome respect for pertussis, which kills far more than scarlet fever, and practically as many as diphtheria. It is never too late to campaign actively against pertussis; isolating the sick, quarantining susceptible contacts, and searching for mild and atypical cases. It seems probable that a more liberal use of pertussis vaccine as a prophylactic for contacts may be advisable, as its use in this manner, while still experimental, seems rather promising of good results, at least in modifying the severity, even if it does not always prevent the incidence, of the disease. The use of pertussis vaccine seems to be without danger, and it is advisable to try it out on a larger scale under practical conditions. Freshness of the vaccine is imperative and large doses should be given. The course for an infant can be two billion killed bacilli for the initial dose, followed by a four billion and a final four billion dose, given approximately seven days apart.

Diphtheria and measles do not, in this age group, become a significant factor in mortality.

Another measure for the prevention of communicable diseases is the education of parents to avoid the exposure of children to such diseases, either deliberately or accidentally. Some have a mistaken idea that children should have many of the common contagious diseases at an early age, and deliberately expose them to known cases. Mortality statistics show that the longer infection is postponed the less is the mortality rate.

The fourth main group of causes of death under one year of age is named "Diseases of Early Infancy," and is made up of general causes termed "Premature Birth," "Congenital Debility" and "Malformations." This group causes the largest percentage of deaths under one year of age. So far we have made little progress in combatting deaths from these causes. It is a singular characteristic of deaths in this group that their rates do not vary greatly under different social or environmental conditions. In other words there seems to be a fairly constant rate of birth and death of congenitally weak, malformed and unfit-to-survive infants. What the reason for this may be, whether ill-matched matings, or a hereditary factor, or purely fortuitous circumstance governed by the law of chance, we cannot say; statistics are not available to guide us. The safest and most logical position to take, at present, is that better prenatal and obstetrical care should be encouraged by health departments, as hopeful of reducing both maternal and infant mortality, and as a measure of social value. But we should be careful not to promise great death rate reductions, as yet.

In the final group of miscellaneous causes of death there are a number of causes which probably may be reduced by various measures; no doubt education of the mother in the care of her child will help to this end.

This brief examination indicates that while there are certain important things which the health department may do favorably to influence the environmental factors which bear on infant mortality, nevertheless the thing of greatest importance is the intelligent care of the child by its mother. In other words, education of the mother in infant hygiene is probably the greatest single weapon in the fight for the reduction of deaths from causes 1, 2, 3, and possibly 5.

It is not, however, practicable to bring the mother to the education, as we bring the child to school. The responsibilities and cares of the household usually stand in the way. The instruction must be brought to the mother to be effective. This is the work of the public health nurse, or the child hygiene nurse, or the infant welfare nurse. Call her what you will, she is probably the most significant single factor in the modern health department. A poster entitled "A Health Department Without Nurses Is No Good," displayed at the 1918 meeting of the American Public Health Association, was guilty of but slight exaggeration.

The public health nurse brings to the mother direct, tangible demonstration of proper measures for the care of her baby, not theoretical or book instruction. She shows the mother not only how to avoid bad methods of child care, but demonstrates good methods, and does so under the actual conditions existing in the home, not under the ideal conditions found in a well-equipped clinic. She often helps to undo the mother's mistakes by giving the sick child proper care under the direction of the family doctor or the municipal physician, but this is a secondary feature of her work, for she cannot do daily sick-bed nursing without neglecting her more important educational work. This does not refer to bedside demonstrations in nursing care, for these are a very necessary part of her duties as a teacher.

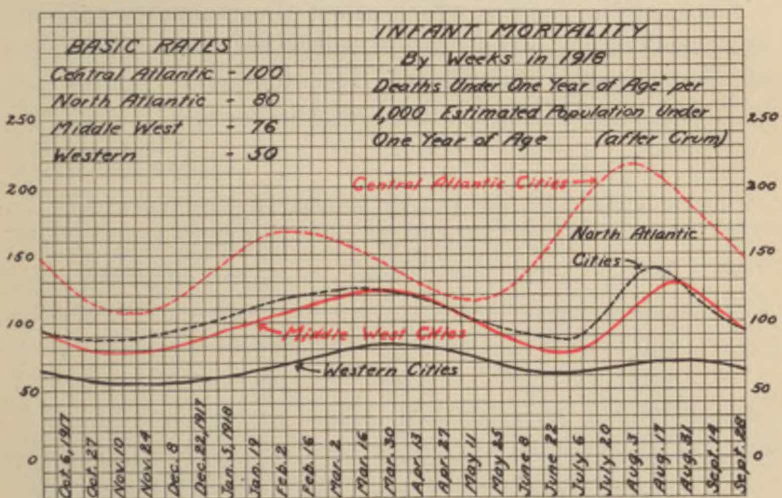
In the notable reductions in infant mortality which have been accomplished in recent years, the public health nurse has borne an important and essential part. As evidence of what has been accomplished, the following figures are suggestive:

TABLE XII—INFANT MORTALITY RATES

| Year | New York City | New York State exclusive of N. Y. City | U. S. Reg. Area |
|---|---|---|---|
| 1904 | 162 | 134 | |
| 1905 | 158 | 137 | |
| 1906 | 154 | 140 | |
| 1907 | 145 | 139 | |
| 1908 | 128 | 136 | |
| 1909 | 130 | 126 | |
| 1910 | 126 | 135 | |
| 1911 | 112 | 118 | |
| 1912 | 105 | 114 | |
| 1913 | 102 | 120 | |
| 1914 | 94 | 105 | |
| 1915 | 98 | 100 | 100 |
| 1916 | 93 | 96 | 101 |
| 1917 | 89 | 94 | 94 |
| 1918 | 92 | 104 | 101 |
| 1919 | 82 | 74 | 87 |
| 1920 | 85 | 87 | 86 |
| 1921 | 17 | 81 | |

THE FIGURES JUST PRESENTED GIVE THE "INFANT MORTALITY RATE." This is the number of deaths under one year of age, per 1000 live births, in a calendar year. This ratio is used, in dealing with infant mortality, rather than the death rate per 1000 infants living under one year of age, for the reason that in intercensal years the population under one year of age cannot be closely estimated. However, the infant mortality rate based on births is subject to error also, for the reason that if we do not have nearly complete birth registration the apparent rate will be higher than the actual; if the death registration is deficient, the apparent rate will be lower than the actual. If the percentage of death registration remains nearly constant, while the percentage of birth registration materially increases, there may be an *apparent* lowering of the infant mortality rate, though not an *actual* reduction. In California, for example, in twelve years there has been an apparent reduction in the infant mortality rate of about 51 per cent. In the same period the birth rate increased (apparent, on account of more perfect birth registration) about 67 per cent., while the infant death

Diagram No. 2.




rate per 1000 living under one year of age decreased only about 26 per cent. Approximately one-half of this reduction in infant mortality rates was apparent, and not actual.

The infant mortality rate has been called the most sensitive index we have of social well-being, and to a considerable extent of the effectiveness of public health administration. But in using it as an index of health administration efficiency we must take certain factors into consideration, just as we must take such factors as age, sex and race composition of the population into consideration when we judge the healthfulness of a community from its general death rate. It is proper at this point to call attention to the marked variations in infant mortality rates in various sections of the United States, as shown by Crum in the April, 1919, issue of the American Journal of Public Health. These variations may be explained partly by climatic conditions and partly by other factors. (See Diagram No. II.)

Some of the factors which affect the mortality rate are race, nationality, urbanization, industrialism and longevity of the parents (heredity). The following figures are interesting as bearing on these various factors.

Table XIII—Race and Infant Mortality, New York City

| Year | White | Colored |
|---|---|---|
| 1915 | 96 | 202 |
| 1916 | 91 | 193 |
| 1917 | 87 | 169 |
| 1918 | 90 | 171 |
| 1919 | 80 | 151 |
| 1920 | 81 | 164 |
| 1921 | 69 | 136 |

TABLE XIV—NATIONALITY AND INFANT MORTALITY

| | Children's Bureau | | | H. F. Gray |
|---|---|---|---|---|
| Nationality | Waterbury, Conn., 1914 | Johnstown, Pa., 1911 | Manchester, N. H., 1913 | Vacaville, Calif., 1910–1918 |
| All Nationalities | 121 | 134 | 175 | 111 |
| Native Whites | 98 | 104 | 141 | |
| Italian | 112 | 183 | | |
| Lithuanian | 205 | | | |
| Irish | 182 | | | |
| Slovak | ... | 177 | | |
| Serbo-Croats | ... | 264 | | |
| French-Canadians | ... | ... | 207 | |
| Polish | ... | ... | 174 | |
| Greek | ... | ... | 133 | |
| White other than Latins | ... | ... | ... | 44 |
| Spanish and Italians | ... | ... | ... | 263 |
| Chinese and Japanese | ... | ... | ... | 98 |

While the various racial and national groups directly compared live under the same general environmental conditions, environment cannot be entirely excluded as a factor in the death rate differences, as racial and national customs and food habits no doubt partly account for differences in the infant mortality.

Brend[1] gives the following figures bearing on the variation of infant mortality in Great Britain under urban and rural conditions:

[1] Health and the State, E. P. Dutton & Co., 1917.

Table XV

| | Average | Range |
|---|---|---|
| *Rural* Districts in England, 1914 | 62 | 54 to 68 |
| *Rural* Districts in Scotland, 1914 | 57 | 46 to 69 |
| *Rural* Districts in Ireland, 1914 | 50 | 38 to 60 |
| *Urban* Districts in England, 1914 | 138 | 122 to 184 |
| *Urban* Districts in Scotland, 1914 | 124 | 110 to 135 |
| *Urban* Districts in Ireland, 1914 | 144 | 143 to 145 |

In France, for 1912, he gives the following figures:

For towns of 5000 population and over........... 111
For rural districts............................ 58

In connection with these figures it should be noticed that some cities may have exceptionally low infant mortality rates, if there is no marked overcrowding or intensive industrial development, and if other conditions are favorable. Such Pacific Coast cities as Seattle, Berkeley and Palo Alto are examples of large, medium and small sized cities with very low infant mortality rates. It should also be noted that New York City, in the face of very unfavorable environmental and racial conditions, has succeeded, by hard work and large expense under intelligent direction, in hammering down its infant mortality rate to a figure of which its health department may justly be proud.

Heredity seems to play a large and important part in the determination of infant mortality. Longevity in the parents presupposes a low infant mortality, as the following figures show:

Table XVI—Percentages of Children Who Died in the First Five Years of Life, According to the Age of Death of Either Parent (Data of Beeton and Pearson) (3855 Children)

| | Age of parent at death | | | | | |
|---|---|---|---|---|---|---|
| | All ages | to 38 | 39–53 | 54–68 | 69–83 | 84 and over |
| Per cent. for mothers.... | 28 | 52 | 38 | 30 | 20 | 10 |
| Per cent. for fathers..... | 26 | 49 | 34 | 27 | 22 | 17 |

Table XVII—Percentages of Children Who Died in the First Five Years of Life, According to the Age at Death of the Father. (Royal Families—3200 Children Total Investigated) (Data of Ploetz)[1]

| | Age of father at death | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | All ages | 16–25 | 26–35 | 36–45 | 46–55 | 56–65 | 66–75 | 76–85 | 86 and over |
| Per cent. for fathers | 28 | 52 | 32 | 31 | 31 | 28 | 26 | 24 | 3 |

[1] Popenoe and Johnson "Applied Eugenics" MacMillan Co.

Three hundred and forty long-lived families (A. G. Bell): 119 deaths under 5 years of age among 2259 children; a rate of 53 per 1000, for the first *four* years of life.

The foregoing figures are strong evidence that heredity is an important factor in infant mortality. In the first group (data of Beeton and Pearson) the families were not specially selected to eliminate any environmental factor, but in the second group (Royal families) the environmental conditions were apparently as good as money and knowledge could make them. And yet, with the environmental factor eliminated, the infant mortality rate is closely associated with longevity in the parents. We cannot escape the conclusion that vitality and ability to live are to a considerable extent dependent on heredity.

Poverty has been much discussed as a cause of a high infant mortality, but it is doubtful indeed whether poverty, *per se*, is an actual cause of such mortality. That it is frequently an accompaniment of high infant mortality is undoubtedly true, but a cause and effect relationship has not been proved, and is decidedly doubtful. Brend, for example, calls attention to the fact that the agricultural laborers in rural Wiltshire (England) are the poorest paid class of people in the nation, yet the infant mortality rate among them is very low (about 60 per 1000). Thousands of families of children have been raised under pioneer conditions, in extreme poverty, and yet the available evidence is that the mortality among them has been very low. The strong virile men and brave women who developed the West were usually poor in material possessions, but their children were sturdy and fitted to survive probably because of a fine heredity.

## CHAPTER XI

# CHILD HYGIENE

After the first year of life, the principal causes of mortality alter their relative importance. Table XVIII (P. 93) is derived from the 1917 Mortality Statistics for the U. S. Registration Area, to indicate these changes.

In the second year of life, congenital debility and malformations disappear, as a significant cause of death, and diarrhea and enteritis assume first place. Pneumonia takes second rank, followed by measles. Disorders of the nervous system, largely meningitis and convulsions, take eighth rank; meningitis and convulsions are, however, objectionable terms, unless carefully qualified by stating the primary cause of death, which would often lead to deaths from such reported causes being classified elsewhere. Tuberculosis, whooping cough and diphtheria, in the order named, are the important communicable diseases following pneumonia and measles.

In the third year, pneumonia assumes first rank, with diarrhea and enteritis second. Diphtheria, in third place, becomes the most important contagious disease, and external causes, which include accidents, are fourth.

In the fourth year, diphtheria assumes first rank of all causes of death, with pneumonia in second place. Whooping cough drops to eleventh place, and scarlet fever appears in tenth place, which it never exceeds. In the fifth year, diphtheria still leads, with external causes second. Pneumonia drops to third, and diarrhea and enteritis to fifth position, while tuberculosis rises to fourth place.

In the ages 5 to 9 years, both inclusive, external causes of death take first place, followed by diphtheria, pneumonia and tuberculosis in the order named. Diseases of the circulatory system appear in eighth place and typhoid fever eleventh.

In the ages 10 to 14 years, both inclusive, external causes are still first, but tuberculosis takes second place. Diseases of the circulatory system jump into third place. Probably this is due in part at least to tonsils and teeth neglected in childhood, and to the sequelae of contagious diseases. This rise in importance of diseases of the circulatory system indicates to a certain extent the need for more prompt and thorough correction of such physical defects as diseased tonsils and bad teeth. Pneumonia drops to sixth rank and diphtheria to ninth, but typhoid fever rises to eighth rank.

This brief tabulation indicates that the factors of mortality in early years vary. The causes of death in early infancy drop down in the scale, while the communicable diseases, accidents and the results of neglect assume importance. These facts point to the need of communicable disease control, the prevention of accidents, and the correction of physical defects, during the pre-school age, an age, however, of low total mortality.

Perhaps because of this low mortality the pre-school age has been rather neglected by health officials. A well-organized health department often has infant hygiene nurses who look after the infants, and school nurses, physicians and dentists who look after the school children, but the pre-school child does not exist for them. He is, however, extremely important. This is the age at which many physical defects may be most easily prevented or remedied. Effective health supervision at this age will lighten the burden on the school medical inspection system.

Table XVIII—Rank of Important Causes of Death by Age Groups. U. S. Registration Area 1917

| Rank | Under one | 1 | 2 | 3 | 4 | 5–9 | 10–14 |
|---|---|---|---|---|---|---|---|
| 1 | Early infancy | Diarrhea and enteritis | Pneumonia | Diphtheria | Diphtheria | External | External |
| 2 | Diarrhea and enteritis | Pneumonia | Diarrhea and enteritis | Pneumonia | External | Diphtheria | Tuberculosis |
| 3 | Pneumonia | Measles | Diphtheria | External | Pneumonia | Pneumonia | Circulatory |
| 4 | Other respiratory | Tuberculosis | External | Diarrhea and enteritis | Tuberculosis | Tuberculosis | Other digestive |
| 5 | Other general | Pertussis | Measles | Tuberculosis | Diarrhea and enteritis | Other digestive | Other general |
| 6 | Nervous | Diphtheria | Tuberculosis | Measles | Nervous | Nervous | Pneumonia |
| 7 | Pertussis | External | Nervous | Nervous | Other digestive | Other general | Nervous |
| 8 | Other digestive | Nervous | Pertussis | Other digestive | Measles | Circulatory | Typhoid |
| 9 | Tuberculosis | Other respiratory | Other digestive | Other general | Other general | Measles | Diphtheria |
| 10 | Measles | Other general | Other general | Scarlet fever | Scarlet fever | Scarlet fever | Genito-urinary |
| 11 | External | Other digestive | Other respiratory | Pertussis | Pertussis | Typhoid | Measles |
| 12 | Syphilis | Dysentery | Scarlet fever | Other respiratory | Circulatory | Diarrhea and enteritis | Scarlet fever |

Note.—The following abridged list of titles for tabulating causes of death has been used in preparing the data of this Table. (1) Typhoid fever. (2) Malaria. (3) Smallpox. (4) Measles. (5) Scarlet fever. (6) Whooping cough. (7) Diphtheria and croup. (8) Syphilis. (9) Other epidemic diseases. (10) Tuberculosis (all forms). (11) Dysentery. (12) Other general diseases. (13) Diseases of the nervous system. (14) Diseases of the circulatory system. (15) Pneumonia and bronchopneumonia. (16) Other diseases of the respiratory system. (17) Diarrhea and enteritis. (18) Other diseases of the digestive system. (19) Diseases of the genito-urinary system. (20) The puerperal state. (21) Diseases peculiar to early infancy, and malformations. (22) External causes. (23) All other causes.

This is an additional argument for the general public health nurse.

After the fifth year of life we enter what may be termed the school period and a number of new problems are presented. Among the most important are the control of communicable diseases arising in assemblages of children; the correction of physical defects which are retardants to educational progress and physical development; the problems of sanitation and safety of school buildings and grounds, and the problem of teaching hygiene.

Taking up first the problem of communicable diseases in schools, we find a number of moot questions. One of them frequently encountered is the matter of closing schools during epidemics. It is sometimes astonishing with what unanimity such closing is demanded, even by well-informed physicians. But valid evidence that schools are essential factors in the spread of communicable diseases is very meager. For different diseases the seasonal rise begins somewhat before, or rather later, than the opening of schools. The strongest argument against closing schools is that such practice does not materially reduce the amount of contact, which largely determines the progress of an epidemic. The children mingle just about as much outside of school as in school. The only exception is in the rural districts with scattered population where there is little intermingling of children aside from school. Closing such schools may be a useful procedure, as an aid to effective control measures required by regulation, but there is no evidence that in cities or towns closing has any effect in stopping an epidemic.

On the other hand, if a few simple procedures are adopted while the schools are kept open, an effective control of an outbreak of disease may be had. With the children assembled in school it is far easier to observe and examine them, suspected and incipient cases being detected at once and sent home for isolation. Absentees can be checked up and missed cases thus discovered.[1]

[1] Dr. M. J. Rosenau, Professor of Preventive Medicine and Hygiene in Harvard Medical School, "Preventive Medicine and Hygiene," p. 1092:

"The question of closing the schools when some one of these diseases breaks out is often a difficult one to decide. If the children commingle out of school, upon the streets and play-grounds, no useful purpose is accomplished by closing the schools. Closing schools is economically wasteful and usually has no influence on the course of an outbreak. Children are less apt to infect each other in the class-room than in the home or on the play-ground. As a rule better results will be obtained by daily inspection of all school children than by closing the schools."

Dr. F. C. Curtis, of Newton, Mass., in the American Journal of Public Health, vol. iv, p. 135, states:

"Among the traditional methods of dealing with an outbreak of communicable disease which have survived from the past, closing the schools when an epidemic appears seems to have lasted the longest. Indeed the public is so convinced that closing the schools is the necessary step to be taken in controlling an outbreak, that, if this is done, it rests assured that vigorous methods of control are in force and is satisfied. If, however, the health officer declines to close the schools he is blamed no matter how active he may be in checking the outbreak in other ways, and tremendous pressure is put upon him to compel him to close them. This pressure comes chiefly from the parents, but often, I am sorry to say, from the practicing physicians, and a man must have a very rigid backbone to withstand it."

J. Scott MacNutt, "Manual for Health Officers," p. 259:

"The matter may be summed up in saying that in sparsely populated country districts, where the children do not associate to any general extent except at school, closing may be effective; but that in towns and cities where there is certain to be a great deal of association in any case, it is of doubtful if of any value."

California State Board of Health, in a letter of instructions to local health officers issued October 19th, 1918:

"In the opinion of the State Board of Health, schools should be kept open whenever the teachers can be relied upon to immediately exclude any child appearing with symptoms of any sort of illness. The well children in schools kept open in this manner will be much safer from contagion than if the schools were closed and they were free to associate on the streets.

"The closing of the public schools is a measure that the State Board of Health does not favor, provided that the pupils are inspected daily by teacher or nurse, those who show signs of illness being immediately sent home."

Even if there be no system of medical inspection, the school teachers can cooperate with the health officer in making this plan effective. Every teacher can observe her children for departure from normal health, and immediately notify the health officer if any suspicious symptoms are noticed. Suspected children can either be held in isolation at the school until the arrival of the health officer, or sent home pending investigation by him, whichever is most practicable and convenient. If this is done the first thing every morning, before classes are convened if possible, experience has shown that there is little if any danger to the other children.

Teachers can be instructed as to what special symptoms to watch for, and this will increase the efficiency of their work. If there be a school nurse or medical inspector, much of the work of detecting incipient cases will fall on them, but the teacher should always be considered the outpost of the line of defense.

No matter how good a school medical inspection system is, most of the control measures must be taken by the health officer. There are five cardinal rules which should guide him in such work.

1. Keep the well children in school under close observation.

2. Look up all absentees, and run down all rumors, to locate and control all missed and atypical cases, and cases in the prodromal stages.

3. Isolate *all* cases, whether frank, atypical or prodromal. Tentative isolations, where disease is suspected, are very useful.

4. Quarantine susceptible contacts for a period equal to the maximum incubation period of the disease.

5. Carefully examine all persons isolated or quarantined, before they are released, and require rigidly that all chil-

dren returning to school after absence obtain a written permit from the health officer.

It is remarkable the promptness with which epidemics of diphtheria, scarlet fever and whooping cough can be controlled by the effective use of these measures. There are indications that they will prove fairly effective with measles, although here a great amount of work is necessary for any successful control, and it is at best precarious. Every possible effort should be made to obtain the cooperation of the school teachers in this work. We have found that they will cooperate well if tactfully shown how valuable and important their assistance is, and are given definite, concise information as to their obligations. In chickenpox and mumps control is ineffective, as there is no sure means of early diagnosis. With smallpox, universal vaccination is the only effective control measure, and the only one worth trying.

Mention has already been made of the health importance of certain physical defects (tonsils and teeth) as possible factors in children's death from diseases of the circulatory system. In addition, physical defects act as deterrents to educational progress, and therefore the educational authorities have taken a great and proper interest in their correction.

Because these two interests bear upon the same problem, there has arisen some difference of opinion as to whether school medical inspection should be performed by the health department or the school department. Each department can present arguments why medical inspection should be under its supervision. Primarily a large part of the work (communicable disease control) is solely the function of the health department, as the legal authority to do this work is lodged by law exclusively in the health authorities. There is nothing to be gained by arguing as to who shall do and pay for the work, provided it be done effectively, and the health and school authorities cooperate thoroughly and cordially. One might as well quarrel as to whether his right hand shall spend money from his left hand pocket, or *vice versa*.

Defective teeth are the most frequently encountered physical defects. It is really appalling the tremendous amount of dental defect existing. In schools of isolated rural districts it is not unusual to find all the children afflicted with dental caries. Very often the first permanent molars are decayed beyond hope of saving. Such conditions not only lead directly to a reduction of physical efficiency, but lay the foundation for systemic disorders which may result in premature death in early adult life.

The teaching of dental hygiene in schools, tooth brush drills, and dental clinics (travelling clinics for rural schools) are the principal corrective measures adopted. Defects discovered on examination are either referred to the family dentist, or corrected in the clinics.

Diseased or hypertrophied tonsils, and adenoids, are next most frequently encountered. Routine medical inspections are needed to detect these defects, which are then referred to the family physician, or to a public clinic. Some large cities maintain special operative tonsil and adenoid clinics for school children. Travelling clinics can be used effectively in rural districts.

Eye and ear defects follow in frequency. The existence of such defects may be easily determined by simple tests, but in the case of eye defects elaborate examination to determine the proper glasses is required. This may be supplied by a special optical clinic, or the family referred to an occulist. In some places an arrangement can be made with the occulists to examine such children as are found on preliminary test to have eye defects.

Teeth, tonsils, adenoids, and eye and ear defects are those most commonly encountered. Eye and ear defects are impediments to school progress, as they directly impair the perceptive faculties. Tonsils and adenoids, aside from the danger of systemic infection, act to retard the mental processes. These defects, therefore, constitute a bar to normal school progress, and are of especial importance to the educational authorities. There are a large number of other miscellaneous defects which it is unnecessary to discuss here. Attention should be called, however, to the growing use of school lunches to combat malnutrition.

Simply to discover a defect and call the parent's attention to it will accomplish little. Experience shows that such a program gets only a small percentage of defects corrected. The examinations must be followed up tactfully but persistently in order to obtain corrections. In this work the school nurse is of especial value as a complement to the work of the medical and dental inspectors. To get results from the follow-up work there must be organized some means of having the defects corrected, either by clinics, or by cooperation of the physicians and dentists.

There is little use in attempting to teach hygiene and sanitation in the schools if the children while at school are surrounded by grossly insanitary conditions. "Example is better than precept." For the educational effect alone the school should have the most sanitary buildings and grounds in the community. This is of importance entirely aside from any need of health protection. There is an old story about a traveller driving with a native through a rural district. As they passed a dilapidated, ramshackle old building the traveller asked "What place is this?" "Oh!" said the native, "that is only our school. If you want to see a fine, modern, sanitary building, come look at our *jail*." Common humanity demands that even law breakers shall be decently treated while in confinement, but it is absurd to build fine jails and other public buildings, and place our children in mean quarters for their schooling.

Most of the sanitary problems which arise in schools are discussed elsewhere, and it is unnecessary to repeat them here at length. Safe, wholesome drinking water, and plenty of it, is one fundamental requirement. The water should be obtainable in a sanitary manner. Excellent drinking fountains, which avoid largely the defects of earlier designs, are now available. They may be had at moderate cost, even for schools which do not have a pressure water system. Sufficient lavatory facilities, with soap, individual towels, and running water, if possible, should be provided, and the important detail of washing the hands after visiting the toilet should be insisted upon. Sanitary excreta disposal is also fundamental. The old-fashioned open school privy is a moral and hygienic abomination, and must be replaced either by modern plumbing or by sanitary fly-proof privies. Schools should set a model for sanitary privies, if used, which the whole community can have as a practical demonstration.

## CHAPTER XII

## WATER SUPPLY

There is an old saying that "You can't tell from looking at a frog how far he can jump." It is also impossible to tell from looking at water whether it is safe to drink. Many a clear, sparkling mountain water, which has been considered locally to be absolutely safe and above suspicion, has become polluted with typhoid or dysentery bacilli. And, on the other hand, there are waters which are certainly unpleasant to look at, but which are not contaminated with disease germs. There are many misunderstandings in the public mind regarding the essential factors in a safe and satisfactory water supply. Too often these essentials are not considered, and relatively less important matters cause great concern. For example, suppose a case of typhoid fever occurs in a family which gets its water from a well. The first possible source of infection suspected is the well. If there is a pig-pen or a horse-barn within a hundred feet of the well, the public is at once convinced that the well water is infected. The fact is overlooked that some human case or carrier of typhoid fever must have contaminated the well water before it could have been the cause of a case of typhoid fever. Other possible causes, such as contact, or fly-borne infection, or milk, are often overlooked. The health officer must take all these possible vectors of infection into account in making an epidemiological investigation of diseases such as typhoid fever or dysentery which may be water-borne.

There are certain general characteristics of water-borne epidemics which the health officer should keep carefully in mind. Such epidemics are as a rule insidious and slow in onset, and gradual in decline, but there are many variations. For example, a single brief infection of a water supply may cause a brief rise followed by a number of irregular, straggling cases for a short period. If the infection is continuous but small in amount, the cases will occur intermittently. A massive continued infection will result in a continuous high case-rate.

Cases are not confined entirely to those who use the water, as there may be a number of secondary contact infections, but a very large proportion of the cases will be among users of the infected supply.

Quite frequently a water-borne outbreak of typhoid fever or dysentery is preceded by an outbreak of intestinal disorders.

If an outbreak is due to polluted public water supply, the cases are generally widely scattered in the community, and not confined to a particular section, but are mostly found among regular or intermittent users of the water affected.

If the preliminary epidemiological investigation points most strongly to a polluted water supply, the next step is to secure reasonable proof of the assumption. This is done in two ways:

1. A *sanitary survey* of the watershed of the supply must be made to locate the point at which the contamination may be received (e. g., sewer, privies, etc.).

2. *Bacterial examinations* must be made of the water to indicate the amount of contamination. It is very seldom possible to isolate *B. typhosus* from a water supply, so we resort to the indirect method of determining the presence of *B. coli*, a normal inhabitant of the human intestine. Chemical analyses were formerly much in vogue, but the *B. coli* determination, if properly interpreted, is of much

more value. It must be remembered that *B. coli* is also found in animal intestines, and therefore the sanitary survey may show both the possibility, or the fact, of animal contamination of the supply, as well as human contamination.

If the epidemiological study, sanitary survey and bacteriological examination combined show that the water supply is the source of infection, three things should be done at once.

1. Notify the public to boil the water (Note: if suspicion attaches to the water, this should be done at first, pending the result of the various investigations).

2. Disinfect the water supply by emergency chlorination with liquid chlorine, or with chloride of lime. This may also be done at the first suspicion of the water, pending the outcome of the investigation.[1]

3. If possible, remove the source of infection of the water supply (privy contents, sewer, etc.), so as to prevent continued contamination of the water.

After these emergency steps have been taken, it is highly advisable that plans be made and carried to completion, at as early a date as possible, to render the water supply permanently safe. Any of the following measures may be adopted singly or in combination:

1. Obtain a new supply of unquestioned safety.
2. Provide adequate long-period storage in large reservoirs.
3. Provide filtration.
4. Provide chlorination.

The health officer should not attempt to prescribe the type of permanent treatment, but should use his influence to see that such matters are placed in the hands of an engineer well-qualified by training and experience to handle the matter.

[1] For emergency disinfection, about three parts of chlorine per million parts of water is advisable until laboratory controls are established.

Water supplies are in general of two main types, surface and ground-water supplies. Surface supplies, as a rule, are more subject to dangerous contamination than ground water supplies, and are more apt to be turbid, or muddy, especially in flood flows. Ground-water supplies are more apt to be hard or highly alkaline, and so more or less unsuitable for manufacturing purposes. The choice of a supply depends largely upon availability and safety; secondly, upon the cost of construction and maintenance of works.

Waters which, while readily available, are unsatisfactory either in safety or hardenss, may be treated to render them safe and satisfactory for consumption. Hard waters may be chemically treated by either the zeolite or lime-and-soda process, to give a soft clear water. This is essential for many industrial processes.

There are several methods of treating water to render it safe, or to improve its appearance. Three main conditions are encountered:

1. Bacterial contamination.
2. Turbidity.
3. Color, tastes and odors.

The various types of treatment designed, either singly or in combination, to correct these factors are:[1]

1. Storage and sedimentation.
    (a) Without coagulation.
    (b) With coagulation.
2. Filtration.
    (a) Slow sand.
    (b) Rapid sand.
3. Disinfection.
    (a) With hypochlorites.
    (b) With liquid chlorine.
    (c) Minor processes.
4. Miscellaneous processes.
    (a) Algicides.
    (b) Aeration.

The application of these types of treatment will be briefly discussed.

1. Prolonged storage in impounding reservoirs is advantageous in removing a large part of turbidity, and in reducing the numbers and virulence of pathogenic bacteria. It may result in unpleasant tastes and odors due to various non-pathogenic micro-organisms, especially algae and diatoms. Impounding reservoirs are primarily built to give a continued supply in low-water periods, and the removal of turbidity and bacteria by sedimentation is a secondary factor.

Sedimentation in special basins is frequently used prior to slow sand filtration, and always, with chemical coagulation, prior to rapid sand filtration. The principal chemicals used for coagulation are sulphate of alumina (alum), and sulphate of iron with lime. Sulphate of alumina combines with the natural alkalinity of the water to produce a flocculent precipitate, which, in settling out, carries most of the turbidity and a large portion of the bacteria with it. The sulphate of iron combines with the lime to effect the same result. Highly colored waters are improved in appearance by coagulation.

2. There are two principal types of filtration through sand, slow sand filtration, and rapid (sometimes miscalled "mechanical") filtration. Both are capable of removing upwards of 96 per cent. of all bacteria and other microorganisms in the water. Slow sand filtration, which is seldom preceded by coagulation, though sometimes preceded by sedimentation, or by preliminary "roughing" filters, is best adapted to waters which are not turbid. Slow sand filters are not adapted to treating highly turbid waters, or waters in which the sediment is very finely divided. The amount of ground area available for the plant is also a factor to be considered. Such filters operate

at an average rate of about 3,000,000 gallons per acre per day, seldom higher than 5,000,000 gallons per acre per day. Slow sand filters, when the surface becomes clogged, are cleaned by scraping off the dirty top layer of sand.

Rapid sand filters are always preceded by coagulation and sedimentation. The filters are operated at a rate of between 100,000,000 and 150,000,000 gallons per acre per day. When the sand becomes clogged, the filters are cleaned by reversing the flow of water, and carrying the mud and coagulant floc over a gutter a few feet above the sand layer. This is spoken of as "washing" the filter. Rapid sand filters are especially efficient in treating highly turbid or colored waters, and may be adopted also where only a small space is available for the plant. Their bacterial efficiency is high, usually well over 95 per cent. removal.

3. Disinfection is primarily utilized to make a polluted water supply safe by destroying the dangerous bacteria, such as *B. typhosus* or *B. dysenteriae.* The two principal types in use are "hypochlorite" disinfection, in which calcium hypochlorite (chloride of lime), or sodium hypochlorite, are used as disinfecting agents; and the liquid chlorine process. The latter, because of the simplicity of handling, the lower labor cost, and the highly efficient dosing apparatus which is now available, is the method of choice. Chlorine gas, when added in the proportion of two parts per million of a moderately polluted water, will effect complete sterilization without causing a noticeable taste. Usually a much smaller dosage will suffice for the average water.

There are several minor types of sterilization, such as ozone treatment and the ultra-violet ray. The ozone treatment is not reliable, and the ultra-violet ray, while promising in certain spheres, is not sufficiently developed to be generally adopted.

4. Among the minor purification processes which may be briefly mentioned are the copper sulphate treatment and aeration. Copper sulphate is especially useful in preventing the growth of algae, diatoms and other micro-organisms which cause offensive tastes and odors, especially in impounding reservoirs. It is usually used in the proportion of about one part per three to five million parts of water.

Aeration, effected by causing the water to splash violently over special towers in the presence of air, is useful in certain cases in reducing offensive odors.

Each of the processes briefly described has a certain field of usefulness, and is adapted to meet certain conditions. A process should not be used in a situation to which it is not applicable. Competent engineering advice should be sought in all cases involving water purification.

Laboratory examinations of water are valuable aids in the sanitary control of public water supplies. Three types are available:

(*a*) Bacteriological
(*b*) Microscopical
(*c*) Chemical

Bacteriologic determinations are of value in indicating the safety of supply. Two counts are used, the gelatin plate at 20 degrees C., and the agar plate at 37 degrees C. The former indicates the total number of bacteria (principally normal water bacteria) which will develop at ordinary temperatures; the latter indicates the number of bacteria which develop at blood heat (principally derived from animal or human contamination). Tests are made for *B. coli* at various dilutions. The isolation of *B. typhosus* or *dysenteriae* is difficult and is seldom attempted.

Microscopical determinations are made for minute animal or vegetable organisms, some of which may cause objectionable tastes and odors.

Chemical analyses are usually made to determine alkalinity, hardness and other chemical characteristics. Formerly much used in connection with nitrogen and chlorine tests, to determine the sanitary quality of the water, the chemical tests have been generally abandoned in favor of bacterial determinations, so far as the sanitary significance is concerned.

Both bacterial and chemical determinations are essential in the control of rapid sand filtration, and chlorination.

A warning should be given in regard to the interpretation of analyses of water. Interpretation of the results of laboratory examinations without supporting data given by a sanitary survey of the supply is a rather unsafe procedure and may lead to grave error. All possible information should be collected as to a water supply, and judgment be based on all the available data, rather than on analyses alone. A series of samples is much better as a basis of judgment than a single sample, and no judgment, except a tentative opinion, should ever be passed upon a single sample. Water supplies are often unjustly condemned as a result of conclusion drawn from a too superficial examination into the question of the presence or absence of actually dangerous contamination.

## CHAPTER XIII

# SEWAGE DISPOSAL

To some people, the subject of sewage disposal is a very simple matter: just run the stuff through a "septic tank," and, they will tell you, it will come out pure and sparkling. At the other extreme are the people who consider it an exceedingly mysterious process, but they have a patent method which is far superior to anything else. As a result of the first and second false doctrines, coupled perhaps with much technical jargon, the public often becomes hopelessly befuddled, and in the end the city fathers may have foisted upon them a sewage disposal plant not well adapted to their needs, and about the operation of which they have but the vaguest ideas.

Of course, the large cities are able to retain high-grade, technically trained and experienced engineers to design and construct their sewage disposal works. Usually, therefore, they get the type of treatment best suited to their requirements. But the small town is seldom able to engage especially expert engineering talent, and often suffers as a result.

There is really nothing mysterious about sewage disposal, neither is it absurdly simple. The general principles are easily understood by anyone of average intelligence, but the working out of the details is an important factor in each installation. It is here that it pays a community to purchase the very best engineering brains it can afford.

Every community has a sewage disposal problem. Many towns under, say, 500 population may not believe it, because they have no sewer system. But human excrement accumulates in their midst, in privies and cesspools, and even if there be no water-carriage sewer system, there is still the problem of excreta disposal. Simply getting the stuff out of sight, in privies and cesspools, does not solve the problem. If extensively used, cesspools eventually seriously contaminate the ground water. In time, too, most of the ground available is used up, and conditions become more or less intolerable. Privies, on the other hand, while they may place the excrement out of sight, seldom get it out of mind.

Not only is the common type of privy a stench in the nostrils of humanity, but it is a most potent danger. The ubiquitous fly provides a return circuit of the dejecta to the alimentary canal of man, for the fly impartially sojourns in the privy or frolics upon our food. Unquestionably the fly and the privy are responsible for a large amount of typhoid, dysentery and intestinal disorders in unsewered communities. It is perfectly possible, however, to make the privy reasonably sanitary and decent, and to keep it so. To accomplish this, the public attitude must be changed. From considering it as a necessary evil (and very evil indeed, at that), the privy must be looked upon as essential, and as necessary to be kept clean, as the kitchen.

The first sanitary requirement is that *the privy must be fly-proof*, the second that it be neat and clean. It must also be private, but accessible. The first is obtained by proper construction, using sound, first-quality lumber, careful workmanship and screens; the second, by care in maintenance. Designs of sanitary privies may usually be obtained from the State Department of Health on request.

Pit privies (in which the excreta are deposited in deep pits dug below the privy) are suitable for use in ground which is fairly uniform, and not seamed or fissured. Where the underlying rock or soil is fissured, as, for example, in limestone formations, pit privies will probably cause a marked pollution of the underground water. If this be used for domestic water supply, a great danger will be created. In such cases, if privies must be used, the pail system (in which the excreta are retained in pails or containers which may be removed and the contents disposed of elsewhere) is more satisfactory. The objection to the pail system, however, is that a collection and disposal system must be provided to take care of the can contents. In unsewered towns this becomes a big problem. It can be solved, as experience has shown, but the great danger, and the usual experience, is that eventually the collection and disposal system either breaks down entirely or becomes inefficient, with a resulting intolerable nuisance.

In the end, and usually very shortly after the installation of a public water supply, the community realizes the necessity of adequate sewerage on the so-called water-carriage plan. With such an installation, the problem of sewage disposal is transferred from the midst of the community to a point more or less distant from the town. The conditions are now reversed. Instead of the disposal of a moderate amount of semi-solid material, scattered through the community, we have the problem of disposal of a comparatively large amount of water, in which the solid wastes are suspended, and this liquid waste is usually concentrated at one point outside the town.

The two most primitive methods of disposal of such sewage are:

1. Discharge into a stream, lake or ocean.
2. Discharge upon land.

If the river flow is large, as compared with the volume of sewage, there may be no nuisance created. But there is serious objection to the discharge of raw sewage into a river, as this may dangerously contaminate the supply of towns which take their water from the stream below. If the stream flow is small, as compared with the sewage flow, there may be great nuisance due to the foulness of the stream. If the sewage is discharged into lakes or bays, there will be, probably, a nuisance due to the formation of banks of sewage sludge.

If the sewage is discharged upon land, there will probably be a nuisance due to deposits of sewage solids upon the surface. This may be obviated to a considerable extent by careful choice of the kind of soil; by rotation of dosing on separate plots, and by cultivation. But seldom is such adequate attention given.

In order to avoid these difficulties, various processes of sewage treatment have been developed, with a view to lessening or obviating the danger or nuisance in sewage disposal. In general four types of processes have become more or less well-established.

1. Processes in which digestion, or liquefaction, of the sewage solids is carried out under anaerobic conditions. The primary purpose here is to reduce the amount of sewage solids to be disposed of.

2. Processes which endeavor to render the sewage stable in character, and incapable of further decomposition.

3. Processes for the sterilization of sewage.

4. Miscellaneous processes of various kinds, some for the recovery of fats, fertilizers or other by-products, etc.

The early experimenters in sewage disposal noticed that when sewage was left in a quiescent condition for a period of time, a state of putrefaction set in, with the digestion or liquefaction of a certain amount of the solids, and the formation of various gasses, such as hydrogen sulphide and methane. This state occurred after the dissolved oxygen in the sewage liquid was exhausted. Because this liquefaction is accomplished by the action, on the organic sewage solids, of certain types of bacteria which develop only in the absence of free oxygen, these processes are generally spoken of as anaerobic, or "septic," processes of sewage disposal. This type of process is a combination of sedimentation of sewage solids, and the reduction of volume of the settled solids by biologic action.

The two principal types of works for treatment of sewage by anaerobic action are the "septic tank," and the "Imhoff tank." Although there are variations in details, fundamentally a septic tank is a chamber or tank in which the velocity of flow of sewage is retarded to a point at which a large portion of the suspended solids will settle out of the flowing sewage, and, being deposited in the bottom of the tank, will undergo anaerobic decomposition and partial solution. This reduces the amount of sludge to be eventually disposed of, but does not alter the fact that this sludge must somehow or other be gotten rid of. In fact the disposal of sludge is the most difficult problem in sewage disposal. Usually sludge is placed upon porous land or gravel beds to drain and dry, and then worked into the ground.

The liquid sewage which flows from a septic tank (the "effluent") is by no means purified. It is often much more foul and offensive than fresh sewage, and may contain many more bacteria. But because a considerable part of the suspended solids are removed, the effluent can be disposed of on land or by dilution in streams or lakes with less nuisance than a crude sewage. Over-foulness of the effluent can often be corrected by reducing the time of detention in the tank. A common fault of inexperienced engineers is to design the tank too large, which results in over-septicization of the effluent.

In order to avoid this over-septicization, by separating the functions of sedimentation and sludge digestion, the Imhoff tank was developed. In this type of tank there are two parts: an upper sedimentation chamber, in which the velocity of flow is reduced to a point at which the solids are largely deposited, and a lower chamber, into which the solids settle, through a slot between two slanting bottoms of the upper chamber. In this lower chamber the solids are partially digested and liquefied by anaerobic action. The comparatively fresh sewage which flows from the upper chamber is not fouled by the decomposition products of the sludge below, and so is less offensive and generally more easily disposed of than is a septic tank effluent.

Sedimentation tanks, with separate tanks into which the sludge and scum are discharged and there digested, are also being used to a limited extent.

Septic and Imhoff tanks are the principal types of preliminary treatment processes in use today. As stated previously, their primary object is to reduce the amount of sludge to be handled. One other preliminary process may be mentioned briefly. Where very large volumes of water are available in which to dispose of sewage by dilution, the mechanical removal of solids by screens is sometimes sufficient. Various types of screens have been evolved. The principal difficulty in their operation is the matter of disposal of the solids, which are highly offensive and potentially more dangerous than tank sludge.

The second general type of process is that in which the aim is to render the sewage comparatively stable and not subject to further decomposition. This is accomplished by methods directly the reverse of septic action, namely, by oxidation of the unstable organic substances dissolved or suspended in the sewage. Often these processes are preceded by sedimentation tanks of various types (including septic and Imhoff) to remove a large part of the suspended solids. Three principal types of plant are in most general use. These are contact beds, sprinkling filters and intermittent sand filters. The activated sludge method, being an aerobic process, may also be included here.

Contact beds are tanks, filled with coarse broken stone or gravel, which are alternately filled with, and emptied of, sewage. After each emptying the bed is allowed to stand idle for several hours, to accumulate a fresh supply of oxygen from the air. The surfaces of the stones or gravel become coated with a zoogleal jelly, consisting largely of aerobic bacteria and microscopic organisms, and various worms and other lower animals. During the filling period, these organisms act upon the organic materials dissolved or suspended in the sewage, and oxidize them, to a considerable extent, to more stable forms of inorganic nitrogen compounds. Contact beds eventually, after long periods, become more or less clogged, due to deposition of solids and accumulation of zoogleal masses, and the filling material then has to be removed and cleaned.

A sprinkling filter consists of a bed of coarse stone, four or more feet deep, with open sides (usually) and large open underdrains, upon the surface of which the sewage (after screening or sedimentation) is sprinkled. In trickling over the surfaces of the stones in the filter, the sewage comes in contact with zoogleal films and various worms, and to a considerable extent the dissolved and suspended solids are oxidized to stable compounds. Usually a sprinkling filter is followed by a sedimentation tank, as it discharges considerable suspended solids, and at certain times may "unload" a large amount of them.

Intermittent sand filters are beds of sand, well underdrained, to which the sewage, usually after sedimentation, is applied at intervals. There is a marked straining action in removing suspended solids, as well as an oxidization of dissolved organic material. The beds are allowed to rest for a period between dosings, to accumulate a fresh supply of oxygen.

In the activated sludge process, air is constantly blown through the sewage, in order to accomplish oxidization of the organic matter by aeration. Sludge from previous treatment, which is "activated," or well-seeded with aerobic bacteria, is constantly added to the inflowing sewage, in definite proportions determined by experiment. From time to time, as required, sludge is withdrawn and run onto drying beds. When fairly dry, it may be disposed of as fertilizer.

There is practically only one process available for sterilization, the third type of treatment process mentioned. This is by chlorination. The Miles acid process, however, can effect a practical sterilization of sewage. Either liquid chlorine, or calcium hypochlorite, may be successfully used for sterilization. The process has been discussed in the chapter on "Water Supply," and it is only necessary to state here that considerably larger amounts of available chlorine are required for treatment of sewage, as compared with water. From 3 to 15 parts per million of available chlorine are necessary to effect reasonable disinfection of sewage, the amount depending partly upon the character of the raw sewage, partly upon the character of other treatment (tanks, filters, etc.), and partly upon the degree of disinfection necessary.

In the fourth type of miscellaneous processes may be briefly mentioned the Miles acid process. In this form of treatment, sewage is acidulated, either by sulphuric acid, niter cake, or by blowing sulphur dioxide gas into it, which effects a more or less complete sterilization, and breaks down soaps to fats, making the recovery of grease practicable. Electrolytic treatment may also be mentioned, but this has never proved practical.

The foregoing presents a very brief survey of sewage disposal processes. A few words may be said in respect of their relative adaptability and efficiency. Where the amount of dilution (ratio of diluting water to the sewage flow) is great, and there is no contamination of a drinking water supply to be considered, simple screening, to avoid nuisance which might occur from the deposition of banks of sewage solids, may be sufficient. Screening, however, presents a problem in disposal of the solids, which are extremely offensive. Well-operated fine screens may be expected to remove from 10 per cent. to 30 per cent. of the total suspended solids in sewage. Screening is often a useful preliminary treatment, prior to subsequent disposal methods.

If screening is insufficient, sedimentation, either in Imhoff or septic tanks, may suffice. These tanks may be expected to remove from 30 per cent. to 70 per cent. of the total suspended solids. The sludge, particularly from the Imhoff tanks, is more easily disposed of than screenings, and is less offensive. Also, the volume of solids to be handled is reduced by these processes from 10 per cent. to 40 per cent. The effluent from either type of tank, however, is not suitable for discharge into a stream used as a public water supply, unless there is further and more adequate treatment.

Imhoff tank treatment is perhaps the most suitable preliminary process in connection with final treatments such as sprinkling filters or intermittent sand filtration. It is also well adapted as a preliminary to disposal by irrigation on land.

Of the oxidization, or stabilizing, processes (contact beds, sprinkling filters, intermittent sand filtration, and activated sludge process), the sprinkling filter is perhaps the most widely used, and is capable of producing a fairly stable effluent. In general a reduction of from 85 per cent. to 90 per cent. of total solids, and a reduction of 90 per cent. to 95 per cent. of bacteria, may be obtained with proper design and careful operation. Sprinkling filters are especially adaptable where the area for a disposal plant is limited. With sufficient dilution ratio, sprinkling filter effluents may be discharged into streams without placing any marked burden on water purification works for supplies taken from the stream below the point of discharge.

Contact beds may be used in place of sprinkling filters, where the available fall through the treatment works is less than required for sprinkling filters. A reduction of total suspended solids, of from 80 per cent. to 90 per cent. and a reduction of bacteria of about 80 per cent., may be obtained. Contact beds have not been as frequently adopted as sprinkling filters, in this country.

Intermittent sand filters in general give the most satisfactory effluent, if intelligently operated. A reduction of 95 per cent. in total suspended solids, and of 98 per cent. in bacteria, can be obtained. The effluent may be, as a rule, safely discharged into any stream.

On account of the high initial cost and expense of operation, the activated sludge process apparently is unsuitable for use, except in very large cities, with conditions especially favorable to it. Many of the details of this process remain to be worked out.

Sterilization by chlorination may be required where a large volume of sewage must be discharged into a stream from which a water supply is taken. As a rule, treatment in Imhoff tanks and sprinkling filters, prior to chlorination, will effect an economy in cost, by reducing the amount of chlorine required to disinfect such an effluent.

## CHAPTER XIV

## WASTES DISPOSAL, SANITATION AND HOUSING

"Oh, Sanitation, what crimes are committed in thy name!" So we might paraphrase a famous saying in respect of liberty. Some of the ancient and discarded notions as to the relation of sanitation to disease transmission could now be dismissed with a smile, were it not for the fact that these ideas are still firmly planted in the minds of many of the elder generation, and also because careless thinkers have demanded clean-up campaigns to ward off or check epidemics of diseases which have no known or probable relation to insanitary conditions. Who among us has not heard some well-meaning elder describe the danger of contracting diphtheria from defective plumbing, or typhoid from "sewer gas," or say that a pile of garbage is dangerous as a source of typhoid, or bad water a source of malaria. And even recently we have seen misguided persons utilize the public fear of infantile paralysis (polio myelitis) as an excuse for putting over a clean-up campaign!

Good sanitation is emphatically desirable in itself, and does not need to be misrepresented to bring it about. We must, however, keep in mind the difference between the aesthetic and the health aspects of sanitation. Take the hog-pen as an example. A hog-pen may be a nuisance, and highly objectionable on aesthetic grounds, but its relationship to health is rather doubtful; we do not contract any human diseases from hogs, except that eating the flesh of hogs may cause cases of trichinosis and tapeworm.

Of course, a filthy hog-pen may breed flies, and these flies may carry typhoid or dysentery if there are adjacent open privies where the flies may obtain infection. But most flies are bred in stable manures. On the other hand, an open privy is a potential or actual menace to health, as well as an offense against aesthetics. A marshy area which breeds Anopheles mosquitoes may not be offensive at all, and yet be a serious menace to health because it produces mosquitoes which are vectors of malaria. And so, if we examine a list of things which have been considered prejudicial to health, we shall find that some have no relation to health at all, but are offensive to the senses; others which are both offensive and a menace to health, and others which are a menace to health but not offensive. The health officer must think clearly and reason logically in regard to these matters, and not let public clamor lead him to spend his best energies and his funds in work which will have little or no effect in promoting the public health.

*Nuisances.*

Many of these insanitary or offensive conditions are classed legally as "nuisances." Anything which is a menace to, or dangerous to, health, or is offensive to the senses, is a "nuisance." Nuisances are of two kinds, public nuisances, which affect a considerable number of people, and private nuisances, which affect only individuals. Public officers may be required to cause the abatement of public nuisances, but private nuisances are ordinarily the concern of the individual affected.

There are several methods of abating a public nuisance. Always there must be due legal notice served. If, after due notice, the nuisance is not abated, the following procedures may be instituted:

1. The nuisance may be enjoined.
2. The nuisance may be abated by direct action to remove or destroy it.
3. The maintainer of the nuisance may be arrested, and upon conviction fined or imprisoned.

Private nuisance may be handled by the individual directly affected, as follows:

1. He may institute an injunction.
2. He may sue for damages.
3. He may directly remove or destroy the nuisance, provided he may do so without bringing about a breach of the peace.

As a general rule, the administrative officer will find that the most simple and effective means of handling nuisances, where the law states that each day of maintenance is a separate and distinct offense, is to cause the arrest of the offender, and the imposition of a fine, with the notification from the judge that further continuance of the nuisance will result in a second arrest followed by imprisonment. If, however, the local justice of the peace will not cooperate with the health officer, then resort must be had to a higher court for a temporary injunction, which is made permanent after a hearing before the judge. Only in extreme emergency should the health officer attempt direct abatement, and he should consult an attorney to make certain that he proceeds legally. Otherwise the health officer may face a suit for damages. In general the health officer is advised to avoid legal measures except as a last resort, as usually one or two notices will bring about abatement.

*Garbage Disposal.*

The matter of garbage and refuse disposal is one that is prolific of nuisance complaints in urban districts. In rural districts this problem is seldom of importance, as no near neighbors are affected. Under rural conditions, garbage is easily disposed of by feeding to hogs or chickens, by burying or burning. But in towns burning will usually produce an immediate nuisance, and ultimately burying may produce a nuisance, and hogs are out of the question. Therefore, it is usually provided by ordinance that garbage and refuse shall be removed from the premises and disposed of elsewhere.

A satisfactory method of handling garbage and refuse collection is not always easy to devise. The following underlying principles, however, are fairly well defined.

1. Garbage while on the premises shall be kept in fly-tight, water-tight metal containers; other non-decomposable refuse shall be placed in separate containers to prevent scattering.

2. Garbage and refuse shall be removed at regular and sufficiently frequent intervals, by designated official collectors. The removal of garbage must be compulsory.

3. Garbage shall be finally disposed of in such a manner as to prevent nuisance. Usually it is necessary that this final disposal be carried on in an isolated place.

Various methods of disposal are in vogue, and are used with more or less success, depending largely upon the intelligence with which the methods are applied. If mixed garbage and refuse is collected, incineration is usually the best method of disposal. Fairly satisfactory types of incinerators have been developed. Mixed garbage and refuse may be used in filling low areas, if promptly covered with a layer of earth. If garbage is collected separately from refuse, the garbage may be subjected to a reduction process for the extraction of grease, the residue being used for fertilizer. This can be done successfully only on a large scale. Garbage may also be successfully fed to hogs, if reasonable precautions in handling it are used. Hog feeding has had an increasing vogue, largely because of the utilization of food refuse that would otherwise be wasted. Hog feeding can be carried out in a sanitary manner, and this method of garbage disposal deserves extension.

The most success in handling the garbage and refuse problem has been had where inspectors have been employed to make regular and frequent inspections of premises to see that they are kept clean and that the garbage and refuse is delivered to the collector. The work of collection and disposal should be handled by the Department of Public Works, or similar official municipal agency, and not by the Health Department, for it takes much time and money from more important health work. The public does not distinguish between degrees of importance, but is likely to consider only the total appropriation, a large part of which may be consumed by operating a garbage and wastes collection system.

*Flies.*

Probably manure disposal offers more real difficulties in sanitation than garbage disposal. It is not realized by the public that horse manure is responsible for the breeding of at least 95 per cent. of the house-fly population of a community. Garbage piles are secondary as breeding places of flies. In well-sewered urban communities it is a matter of question as to whether the common house-fly is a significant factor in the spread of communicable diseases. There is equally little question but that in insanitary rural communities, especially the unsewered small towns with many open privies, the fly is an important factor in disease transmission. In another chapter we discuss the problem of sewerage, and shall not here repeat this subject, except to state that by adequate sewage disposal we practically eliminate the possibility of fecal contamination by flies. The prevention of fly breeding presents another line of attack against fly-borne infection. Since the bulk of common flies (*Musca domestica*) are bred in stable manures, it is obvious that manure disposal is essential to the reduction of flies. Fly-swatting, fly traps, and fly poisons are useful against the few survivors of an effective sanitation campaign, but are hopelessly ineffective if fly breeding is permitted to go on unchecked.

Manure should be regularly and promptly removed from stables, and disposed of by scattering on land, or burning. *Dry* scattered mânure does not breed flies. Manure should be removed at least once every four days in summer as this is the minimum period of larval development in warm weather. Especial care should be taken thoroughly to clean the floors of stalls, as the number of fly larvae that will develop in manure lodged in cracks and crevices in floors is surprising. Stable floors should preferably be made of concrete, with removable wood gratings for the animals to stand upon.

Bins for storage of manure are objected to, as they are seldom kept in sufficient repair to be fly-proof. They usually become fly incubators. If manure must be stored the so-called "maggot trap" is preferred. This consists of a shallow concrete basin, usually $12' \times 6' \times 8''$ inside dimensions, over which is set a wooden grating, made of $1'' \times 2''$ strips set $3''$ center to center on $3'' \times 4'$, supports. The manure is piled on the grating and the basin is half filled with water, on which is floated a film of crude oil. As the fly maggots reach their full larval development, they crawl to the bottom of the pile for the purpose of pupating, drop through the grating into the basin, and are killed by the oil and water. The basin should be flushed occasionally to prevent nuisance.

A few chemicals, such as borax, have been found fairly effective for treating manure to prevent fly breeding, but in general such chemical treatment is less certain and more expensive than adequate removal and disposal.

Where flies are at all prevalent, a strong campaign to have houses well screened should be made by the local health officer.

*Mosquitoes.*

Not only is the mosquito a considerable nuisance, but certain species of the genus Anopheles transmit malaria. Where malaria is present special measures against Anopheles breeding must be taken. The common, or culicine, mosquitoes will breed in practically any collection of water which stands long enough to permit their development. This is about 12 days in mid-summer. But the Anopheles mosquito is a bit fastidious in choice of breeding places, and selects by preference clear water standing but a few inches deep on grassy land. When all such water is removed, Anopheles will breed sparingly in other water collections, if they are not too foul.

There are three lines of attack against mosquitoes. Drainage is by far the most important, as it removes the breeding places. Drainage to prevent mosquito breeding requires, however, more attention to small details than in agricultural drainage. The filling in of low areas which cannot be conveniently drained is a useful complement to drainage.

To supplement drainage operations, the use of oil sprayed on the surface of pools of standing water is effective in killing mosquito larvae. A medium oil of about 30° Baumé gravity is generally used. The film of oil shuts off the air supply of the larvae, and so kills them by suffocation. Oiling should be used as a supplement to drainage operations only, as it is not a permanent measure. Oiling has, however, been successfully used without drainage, or with very little drainage, as a method of demonstrating malaria control through mosquito reduction.

Larvicides, for poisoning the water in which mosquitoes breed, have been successfully used on a large scale at Panama, but are not adapted to small scale operations.

The stocking of standing collections of water with top minnows (*Gambusia affinalis*) is becoming increasingly popular in the South. The minnow devours the larvae, but can operate only where vegetation is kept down.

Careful screening of houses is a useful measure against mosquitoes. Various observations have indicated that effective screening is responsible for from 20 per cent. to 40 per cent. reduction of malaria incidence. The meshes of the screen must run 16 to 18 in the inch to be efficient.

*Rodents.*

The recent re-appearance of bubonic plague at various Gulf ports, and its endemic presence in central California, indicates the importance of rat control measures. The three fundamental procedures against rodents are:

1. Rat-proof building construction, to eliminate rat harbors and breeding places.
2. Measures to cut off the food supply of rodents.
3. Direct destructive measures against rodents.

Rat-proof building construction is fundamental to successful anti-rat campaigns. For this purpose adequate building codes in cities, to require proper construction of all new buildings, is one step. The other step is the rat-proofing of existing buildings. The latter comprises several features, as follows:

1. (*a*) The opening up, or raising, of cellars, basements, etc., to permit free access of air, light and dogs and cats; (*b*) concreting or cementing such areas.

2. The blocking off of run-way spaces in walls, floors, ceilings and attics, by wood blocks, cement, or metal screen.

3. Special protection of food storage rooms or buildings, by concrete, or metal screen nailed to wood work. Barns, granaries, and warehouses must be thoroughly rat-proofed as well as houses. The U. S. Public Health Service has prepared standard specifications for rat-proofing of buildings.

Measures to cut off the food supply of rats include thorough municipal scavenging, with especial attention to the use of covered metal garbage containers. Rubbish heaps should be removed by the scavengers to reduce rat harbor. Attention should be paid to chicken-yards, rabbit pens, etc., to remove surplus food materials.

Direct destructive measures against rodents include trapping, poisoning, fumigating (in ships), the use of poisonous fumes (carbon bisulphide against ground squirrels), and shooting (in rural districts). Poisoning methods are discussed in the chapter on plague.

An effective anti-rodent campaign will include all of these various measures, with adaptations according to local conditions.

*Rural Sanitation.*

Certainly in respect of sanitation the small town or village, if unsewered, is at a disadvantage as compared with either the country or the large city. On isolated ranches the contaminated well, the open-back privy, and the big manure pile cannot do extensive damage, as the chance of introduction of infection from outside human sources is at a minimum.

Whatever communicable disease is spread in sparsely settled districts is primarily due to contact, as a result of the kindly habit of visiting the sick, so much in vogue. But in the small unsewered town the introduction of a single typhoid or dysentery case may easily result in a fly-borne epidemic which spreads through the community until checked by cold weather or exhaustion of susceptible material, unless it is taken vigorously in hand and effective measures of sanitation are applied. And yet it is not necessary for unsewered villages to remain exposed to these dangers. In the absence of sewers, fly-proof privies can be required by local ordinance, and fly breeding can be reduced by a more careful manure and garbage disposal. In some of the southern states such rural sanitation movements are now being carried out in county-wide units and the results in the reduction of typhoid, dysentery and diarrheal disorders of infants have been striking. Hookworm and malaria, two other rural diseases, have also been attacked with marked success.

*Housing.*

The question of housing and health is a matter fraught with many pit-falls for the unwary in logic. For example, we have all heard of "lung blocks," that is, large tenements in which there is an excessive amount of pulmonary tuberculosis. From such cases there arose the idea that house infection was responsible for much tuberculosis, and that tuberculosis was a house disease. Superficially, such a theory seemed warranted, and it was much agitated, especially by social reformers. But a critical examination of all the facts has failed to show any causal relationship between housing and tuberculosis. Chapin (Sources and Modes of Infection, pp. 220–222) gives a brief discussion of this subject, and it is particularly well treated by

Schneider in this "Shortcomings of Socio-Sanitary Investigations," in the American Journal of Public Health, January, 1917. If, therefore, no causal relationship can be logically demonstrated between housing and tuberculosis, how weak must be the case in respect of other communicable diseases.

The effect of bad housing upon the public health apparently must lie, if there is any effect at all, in causing people to live under an unfavorable environment. But again there comes up the question as to whether the bad housing is a causative factor, and not a purely secondary feature; that is, is not the bad housing merely associated with the genetically less efficient, economically and hygienically, and perhaps to some extent also a result of their habits of living? We shall not attempt to settle the question, after raising it; but we should warn against dogmatic assertions that may not be tenable after critical examination.

There is this much to be said in respect of the housing problem that seems to be justified: overcrowding favors closer personal contact, thus increasing the opportunity for contact transmission of disease; bad housing may result in a lessened opportunity to adopt certain measures of personal hygiene, e. g., effective ventilation of sleeping rooms and living quarters, and so in a measure reduce physical resistance to microbial invasion. Yet Park and his associates have shown that the children of the tenements have a higher degree of immunity to diphtheria than do the wealthier children who are less exposed by reason of their better housing and relative segregation.

On these grounds housing conditions may be considered within the scope of the health department, as a secondary activity. But the other social phases of the housing problem so far outweigh the health phase that as a general rule the health aspect of housing may be considered a minor matter. Good housing is emphatically to be desired upon many grounds of social policy, but as a general rule the health officer should simply cooperate with other official and private agencies engaged in housing improvement, rather than attempt to carry on the work through the health department.

## CHAPTER XV

## MILK

From a public health standpoint, there is no food so important as milk. Not only is it an important, even a necessary part, of a child's diet, and hence an indispensable food, but it is also potent for evil, because of its susceptibility to deterioration and contamination.

Milk contains carbohydrates, proteins, fats, and mineral substances in well-balanced proportions, and its direct food value is high. But most important is the presence of certain vitamins which promote growth. Because of their presence the considerable use of good milk should be encouraged in the diet of growing children, and the community should see that there is available for its children an ample, clean and safe supply.

Through the lack of efficient supervision, or the necessary care (and perhaps by accident, in spite of the best care and supervision), milk may become a vehicle in the spread of certain communicable diseases. It may become contaminated by a case or carrier of typhoid fever, scarlet fever, diphtheria, or septic sore throat, and cause explosive outbreaks of these diseases. Or, if unclean and poorly handled, it may cause diarrhea or enteritis in children (summer complaint). The outstanding characteristic of a milk-borne outbreak of disease is its explosiveness. Usually a considerable increase in cases is noted within a few days. An epidemiological investigation of these cases will show that many of them take milk from a certain dairy, and if we make a ratio of cases to customers for each dairy in town, we find by comparison that this dairy has a far higher ratio than the others.

As soon as this has been demonstrated, immediate steps should be taken to check further infections. We may either:

1. Require emergency pasteurization.
2. Stop the sale of milk from the dairy.

The first is preferable, unless the supply is already being pasteurized, in which case we may conclude either:

1. The pasteurization is improperly performed.
2. The milk is contaminated during the bottling, after pasteurization.
3. The milk is contaminated during delivery.

We can check up the efficiency of pasteurization by:

1. Time and temperature tests on several batches of milk, using a standard thermometer.
2. Bacteriological examination, for total counts, of the raw milk, the milk as drawn from the vat after pasteurization, and the milk after bottling.

If the pasteurization is effective, the contamination probably takes place either in bottling or delivery.

Merely finding the dairy that is spreading the infection is only part of the health officer's duty. Really to effect control, we must find the *person* who contaminated the milk. This may be either:

1. A carrier.
2. A "missed case."
3. A case in the prodromal stage.
4. A recovered case back at work too soon.

If the outbreak is typhoid fever, we must take Widal tests of all employees who do not give a history of previous typhoid fever. And from both those who give a history of previous typhoid fever, and from those who give a positive Widal, take specimens of feces and urine to isolate the

*B. typhosus*, thus definitely proving the source. This is not always easy, as carriers may be intermittent and require repeated examination for their detection.

If the outbreak is diphtheria, we may take cultures (nose and throat) of all employees. If scarlet fever, we must question closely for recent symptoms of the disease among the employees, being especially on our guard for the mild, atypical cases which are so often overlooked. With septic sore throat, we must also depend on recent symptoms among employees in the dairy or milk plant.

But in any case we must *find the person* who was the cause of the outbreak, and control him, or we have not succeeded in the essential point of the investigation. Until he is found, our control is precarious, and he may go to another dairy or food establishment and start the trouble all over again, as well as cause other cases by direct contact.

Such contamination of milk supplies may occur with equal facility in either a clean, high-class dairy, or a low-grade dairy, unless the safeguard of pasteurization is provided. Even with pasteurization, we cannot protect the public if the bottler or delivery boy is the source of infection, unless we have a skilled, active, intelligent health officer to ferret out the source of infection, and by isolation and proper treatment render the carrier inocuous. On the promptness and intelligence with which preventive measures are taken depends successful control in such cases.

The possibility of infection, especially of children, with tuberculosis, through the medium of milk from tuberculous dairy cows, has led to strong efforts to reduce this danger. Our present procedure of requiring that all milk shall be obtained from cows free from tuberculosis, as determined by tuberculin tests, or else shall be pasteurized, seems to meet completely the needs in this respect. Tuberculin testing of dairy cattle should be performed by skilled veterinarians, and the intradermal and subcutaneous tests should preferably be alternated for best results.

The protection of milk supplies from contamination is but part of the duties of a health officer, since by pollution with extraneous dirt and filth milk may be greatly deteriorated in quality, with resulting intestinal disorders in infants. The fundamentals of sanitation in the production of milk are simple in theory, but in practice require that capacity for taking infinite pains that is found in but few people. These fundamentals are:

1. Healthy, clean dairy cows. Semi-annual or more frequent physical examinations should be made by a competent veterinarian. If the milk is not pasteurized, the tuberculin test should be required at least annually. The udders should be washed in clean water before milking, and the flanks curried and brushed free from coarse dirt and loose hairs.

2. Clean, healthy milkers, who milk with clean, dry hands, and who wear clean outer garments.

3. The small-top milking pail.

4. Clean utensils and delivery containers, which must be thoroughly sterilized.

5. Immediate cooling of the milk, after drawing from the cow, to 50 degrees F., or lower.

6. *Keeping the milk at or below* 50 *degrees F.*, until delivered to the consumer.

7. Prompt delivery of milk after milking.

8. A separate, clean, screened and well ventilated milk-house.

Some cities, realizing the hopelessness of attempting to bring all the milk up to the highest standard, have adopted a policy of grading milk. Certain standards for different grades are set, and milk classified and labeled according to the standard met. The standards are based partly on bacterial counts, and partly on sanitation of the dairy and milk plant, as determined by the dairy score card. The grades are, "inspected," "Grade A," and "Grade B." "Certified milk" is milk which is certified as to quality by a Milk Commission of a County Medical Society, the dairy paying the expenses of certification, which usually adds from 2 to 5 cents per quart to the cost of the milk. It is not possible to introduce a grading system unless adequate inspection and laboratory facilities are available. If, however, these are available, a good system of grading is valuable and advisable. Without these facilities, it is impracticable. The dairy score card is an attempt to evaluate, and make available for comparative purposes, the various sanitary factors in the production of milk. There are two general types:

1. The Bureau of Animal Industry cards.
2. The Woodward system.

In the B.A.I. cards, there are separate score cards for dairies, creameries and city milk plants. One hundred points are given for total perfection (40 for equipment, 60 for method), and each individual item entering into the production and distribution of milk is given a certain number of points if perfect. Each dairy or milk plant is rated on each item, according to the relative perfection of the methods and equipment, and the sum total is called the "score," which is really a percentage relation to possible perfection. The B.A.I. cards score the dairy or milk plant, without reference to the final product, whereas the Woodward system attempts to score the final product, the milk. In the Woodward system there is a score card for the dairy, but in addition there are points allowed according to the number of bacteria, amount of butter fat, etc., the perfect score being 1,000. This system, while in some respects more logical, is more complex, and requires a very efficient system of inspection, with thorough laboratory control, for its operation. Few cities use the Woodward system, though its use is increasing. The B.A.I. card is almost universally used, modified slightly, however, in some states to adapt it to local conditions. The dairy score card, while simple, requires some practical experience to enable one to use it correctly, and certain definite rules of scoring must be followed to obtain comparable results. These detailed rules have been prescribed by the Bureau of Animal Industry and various state inspection departments. The score card has proved to be an effective means of improving dairy sanitation, especially if the scores have been published from time to time in the local papers for the information of citizens.

Of all the modern safeguards to the milk supply pasteurization has without doubt been the most effective, at least in the large centers of population. While there are two general methods in pasteurization, the flash method and the holding method, the latter is the process generally used and accepted.

In the holding method, the batch of milk is heated quickly to 140 to 145 degrees F.; held to that temperature for 30 minutes, and then cooled rapidly to 50 degrees F., or lower. By this process, if effectively performed, the pathogenic bacteria are destroyed and other bacteria greatly reduced in numbers, but the cream line, chemical characteristics, enzymes and flavor are not affected. Recent work would indicate that the vitamins are injuriously affected only when much oxygen is introduced during the pasteurizing process, as when the milk is vigorously stirred. There are various types of pasteurizing apparatus on the market. Probably the most perfect is that which pasteurizes the milk in the bottle, but this is not often used, the predominant one being the batch pasteurizer.

Properly conducted, pasteurization renders milk safe. It is not, however, a substitute for cleanliness in production. Cleanliness in production and prompt delivery at a low temperature must be insisted upon even if a clarifier, followed by a pasteurizer, be used. Clarification cannot remove filth dissolved in the milk; pasteurization cannot deliver a milk of low bacterial count, if the raw milk has millions of bacteria. No one likes cow manure in milk, even if partially cooked.

Attempts to raise the standard of a milk supply have always been met with the cry that it will increase the cost of milk. As a matter of fact, those things which bring about clean milk do not cost anything more than intelligence and attention to details. Their effect upon the cost of milk is slight, if appreciable. But, supposing the cost is increased slightly, what are two or three cents per quart additional cost, compared with the baby's life? Campaigns for better milk supplies should be directed to the consumer as well as the producer; the consumer must know the dangers of cheap dirty milk. It is impossible to obtain a perfect milk supply by passing an ord nance. It requires hard, steady work over a period of years, with constant inspection, laboratory work, and above all, education, both of the dairyman and the public. One step at a time should be taken, and from five to ten years are usually required to get real results. But they are well worth the time and effort. Remember, however, that a small, scrupulously clean dairy can turn out excellent milk of a low bacterial count, if intelligent methods are used, while some dairies with expensive equipment produce dirty milk. A certain minimum of equipment is essential, but put more trust in a clean dairyman's method than in fine equipment.

A final word of caution may be given in regard to bacterial counts in milk. Standing alone, a bacterial count means practically nothing. It must be interpreted in the light of the conditions of production and distribution. For example, a clean but uncooled milk will in a few hours give a fairly high count, whereas a refrigerated dirty milk may give a fairly low count. Counts are usually higher in summer than in winter. A milk delivered locally in a few hours after milking will give a much lower count than a milk which must be transported a long distance and delivered many hours after milking. Furthermore, there is always a possible variation of some magnitude between separate counts taken from the same bottle, even with a careful and uniform technique. Therefore we must *interpret* bacterial counts in the light of the conditions of production and distribution, and judge from series of counts rather than from single samples.

## CHAPTER XVI

## FOOD AND FOOD POISONINGS

From a public health viewpoint, the sanitation and general control of food supplies has somewhat complex aspects. Unfortunately, in the public mind, our sense of aesthetics and of commercial fraud has become rather confused with health, and it is not always easy, even for the trained sanitarian, to escape from lapses in clear thinking and sane action. The situation is further complicated by the fact that the law has imposed certain duties, not necessarily related to the control of disease through food, upon the health authorities.

Whether or not an adulterant, unless poisonous, is added to a food product, is of slight public health importance. Aside from deaths from poisoning, there is no evidence that such adulteration is a significant factor in mortality or morbidity. There is, also, no evidence that uninspected meat is a significant factor in mortality or morbidity, unless eaten raw. And yet we find many health departments spending much money, and laying great stress, on food analysis and meat inspection, when inspection to maintain adequate sanitation of foods, and at least an occasional medical inspection of food handlers, is neglected. There are, also, health departments which spend more on food inspection and analysis than on any other function. Almost always this means a neglect, or ineffective performance, of essential activities which reach directly the most important causes of sickness and death. It is not urged that food inspection and control is not a desirable thing.

But a proper balance, and a proper emphasis on essentials, should be obtained in a well-directed public health organization.

The control of the quality of food, and the maintenance of food standards, is primarily a function of the federal and state authorities. Only the largest cities can attempt to do the inspection and laboratory work required, and it is preferable that the analytical work be centralized in state laboratories for reasons of economy. Foods sold in interstate commerce are inspected and analyzed by the Bureau of Chemistry of the United States Department of Agriculture, which administers the Federal "Pure Food Law" (Food and Drug Act of June 30, 1906), and promulgates thereunder the "Food Inspection Decisions" and "Service and Regulatory Announcements." These regulations prescribe the details of food standards and inspection methods.

In general, state food inspection services, where organized, follow closely the rules, regulations and standards of the Bureau of Chemistry. Their functions pertain to foods sold or manufactured within the state and do not cover interstate commerce.

Since meat inspection often becomes a function of local health departments, it is advisable that the health officer should have a fair working knowledge of the subject, although the details of such work should be handled by a qualified, experienced veterinarian. All meats which are shipped in interstate commerce must first be inspected and passed by inspectors of the Bureau of Animal Industry, U. S. Department of Agriculture. Inspections are made only at approved establishments, which are abbatoirs which meet the minimum standards of sanitation set by the Bureau. The standards of sanitation, and the rules for inspection and condemnation of meats, are set forth in detail in B.A.I. Order No. 211, "Regulations Governing Meat Inspection of the United States Department of Agriculture." These Regulations should be the standards of all local meat inspection services. In federal inspection, both ante-mortem, and post-mortem-at-time-of-slaughter, inspections are required. Animals which are sound and free from disease are passed for food. Under some conditions infected animals may be "passed for sterilization" and rendered into lard and tallow. Animals which are unsound or extensively diseased are condemned and tanked for fertilizer. Carcasses with slight disease involvement, as in tuberculosis or actinomycosis, may be passed for food, after the infected parts or organs are removed and condemned.

Most of the larger municipalities maintain more or less satisfactory meat inspection services, modelled on the B.A.I. regulations. Very few of the small municipalities do so, and as a result the poorer classes of meats, which would not pass inspection, are often sold in small towns. A few small towns with active health officers have avoided the worst of this evil, without incurring the heavy expense of ante-mortem and at-time-of-slaughter inspection, by requiring that the tongue, lungs and liver be left attached by natural tissues to the carcass until inspected, prior to sale, by the health officer of the place of sale.

In respect of the sanitation of foods, which is primarily a matter of local inspection, the aim is to obtain a reasonable minimum of sanitary conditions under which food is produced and sold, and also to limit, as far as possible, carriers or cases of communicable diseases as food handlers. The subject therefore roughly divides itself into the sanitary inspection of food premises and methods of food handling, and the medical inspection of food handlers to determine their freedom from communicable disease. A third division is that of inspection for unsound or unwholesome food, and its condemnation.

Food sanitation regulations should provide for the reasonable protection of foods from contamination during manufacture, preparation, storage, sale and delivery. Food premises should be so constructed as to be easily cleaned, and to be maintained at all times in a clean condition. They must be adequately screened against flies. Adequate lavatory and toilet facilities must be provided for employees. It is of course essential that these latter be located together, and that employees be required to wash their hands with *soap and water* after visiting the toilet.

Containers and utensils must be thoroughly cleaned and sterilized between individual uses, and alternative acceptable methods of sterilization stated. Foods must be at all times protected against contamination by flies and dirt.

No person having, or suspected of having, a communicable disease, should be permitted to work in a food establishment. The best procedure, undoubtedly, would be to require routine medical examination of all food-handlers, with initial examinations *before* entering employment. If this amount of work is too great to be undertaken, there should be at least a requirement that the health officer may exclude from food handling any person suspected of having a communicable disease, until such time as a medical examination, supported by appropriate laboratory tests, shall demonstrate a freedom from infection.

In another chapter are discussed a few diseases due to animal parasites, such as trichinosis, which are transmitted by foods, and in other chapters the role of foods in the transmission of typhoid fever has been pointed out. There remains a class of food intoxications or poisonings to be considered briefly.

In diseases such as botulism, it is not the action of the causative organisms on the human tissues which causes the disease, but the action of a toxin, or poison, produced in the food by the organism prior to ingestion. Botulism has recently come into prominence in connection with the eating of ripe olives, but as a matter of fact it has been a known disease for many years. It was first commonly spoken of as "sausage poisoning." The toxin of botulism is easily destroyed by heat, so that even though the toxin be present in food, thorough cooking will destroy it and prevent the disease. Avoidance of foods, particularly canned and preserved foods, which appear unsound, or smell or taste spoiled, is quite advisable.

There are also other forms of food poisoning which may be mentioned. Of such, meat poisonings are probably the most common. The flesh of swine affected with hog cholera may produce an acute febrile attack with diarrhea. Paratyphoid fever is at times caused by infected meats. There are also toxaemias occasionally caused by decayed vegateble products, especially such as are rich in proteins.

## CHAPTER XVII

## EDUCATION AND PUBLICITY

Some one once said that the American people liked to be humbugged, and it is also stated that there is "one born every minute." This no doubt accounts partially for the street fakir, the fake stock salesman, and the patent-medicine vendor. But they get their message over to a considerable number of people every year, simply because they are clever enough to present their wares so attractively that many will buy.

Everyone is engaged, to a greater or less extent, in selling something. It may be a manufactured article, or personal service, or information, or a combination of these things. Health officials are engaged in *selling health*, the public's health, to the public, that is, to the people and their elected representatives. And wise health officials will do well to dress their wares in an attractive garb, and use the same keen selling psychology that the patent-medicine fakir uses. Of course, the health officer must observe better ethics and hold a higher regard for the truth.

Successful government is dependent upon an intelligent citizenship adequately and accurately informed as to facts. If the public is to act intelligently in respect of health matters, it must be informed as to the facts, and as to the health needs of the community. No one is better prepared to give the people the facts than a live, intelligent health officer. And if he expects the public to support his work, and cooperate with him, he must see that the public knows the facts.

Education and publicity are two effective weapons in the armament of the health officer for his fight against disease. By education we are not now referring to the education in our schools, not even education in hygiene; that is the function of the school department. We refer primarily to the informing of adults as to the general and specific facts in regard to public health, sanitation, infant and child hygiene, the prevention of communicable diseases, etc. Few of the facts in regard to these matters have been heretofore taught in schools, except to limited groups in the universities, and owing to the rapid progress of science, that which was acquired by the children who are now adults may be obsolete.

There is always an opportunity to present to the people accurate and truthful information in regard to public health matters. It is the duty of the health officer to do so, as a part of his work. Few people have the time or inclination to do the extensive reading and study necessary to obtain knowledge in regard to these matters, but the health officer must do so to keep abreast of progress in his profession. However, he does not need to be a literary artist, nor an orator, to tell the public about the facts of public health. All that is necessary is to say it simply, straightforwardly, in plain English, and at opportune times. If a few cases of diphtheria appear in his community, that is a very opportune time to tell the public how to prevent diphtheria. If in early summer several babies die of intestinal disorders, that is an excellent time to tell about the proper diet and care of children in summer. If one can tie up his informative material with a matter of news, it will "get over" more effectively to the people.

There are several channels for education. Newspapers are not educational mediums; they are vehicles of news. But one can do much educational work with a news item if he words the facts to be presented as a part of the news. Public lectures are informative, but usually not popular because they do not amuse. But if they are made interesting through the use of moving pictures or lantern slides, a good audience can often be obtained. Printed pamphlets and circular letters are good, if they get into the hands of people who will read them, but a large percentage is ineffective because so much of it goes into the waste-basket unread, or is filed away to be read at some future time, which may never come.

Paid advertising in newspapers, magazines, bill-boards, etc., is especially effective, but few health departments attempt it because of insufficient funds.

The use of placards in public places, card exhibits in the corridors of public buildings, bullet'n boards bearing timely items of interest, models of sanitary and insanitary privies, wells and dairies, together with interesting laboratory specimens, are all of value in educating the public on matters of health and in advertising the activities of the health department.

Don't forget to talk health at every proper opportunity; to friends, acquaintances, the people who come into the office, to the school children—*especially to the school children.* Teachers are usually glad to have the health officer give short talks, and it is often remarkable what the children will take home and re-tell to their parents. But have a care to speak with exceeding clearness, or what they tell to their parents will be still more remarkable.

But that is not all that the health officer should do along this line. He should let the public know what he is doing and why; and what he would like to do, but cannot, and why not. In other words, he ought to keep the public in constant touch with his activities. This is publicity. It is news, and the newspapers will take any reasonable amount of it. It is information to which the public is entitled, and which it is glad and eager to have. And it helps the health officer in several ways.

In the first place, it shows the public that the health officer is on the job and accomplishing things. It is remarkable how many people look upon the health officer simply as some one to investigate nuisances and tack up placards. Many people never come in contact with him except under somewhat unpleasant circumstances, when he is "mean" enough to restrict their liberties in various ways. But if from day to day there appear new items of the various and interesting things that every live health officer is doing for his community's welfare, the public soon gains a different viewpoint of his work. And if, when his annual or monthly reports come out, there is shown a steady reduction in the death rate, or a lessened prevalence of communicable disease, or so many physical defects of children corrected, or a large number of sewer connections made or nuisances abated, or improvements in the milk supply, and so on, then the public begins to look upon the health officer, not as a person to "cuss" over the telephone when on Halloween Night some small boys drape a dead cat on the gate post, but as a live, active, constructive force for community progress and betterment.

As a part of his publicity, as well as for record, the health officer should make reports of his work to his local governing board, and through them, to the public. He should remember, however, that reports serve two purposes, records and information. The mistake should not be made, as is so often done, of cluttering up a public report with a mass of statistics, which no one will read. Make the report so attractive in form and interesting in statement that it will be read. If statistics must be published, give them separately as an appendix to the report. There is much money wasted on printing the average health department report which is burdened with a mass of statistics. *Tell the story of what the statistics show*, in the report, but if it is to be read, leave out the detailed figures.

One final caution should be given; never overstate the case, or exaggerate, or state as a fact something that is still in the experimental state, no matter how promising it looks. Such exaggeration, if found out (as it often is), makes the public doubt other statements, even such an established truth as that the Klebs-Loeffler bacillus causes diphtheria. The patent medicine fakir can get away with it by moving on to the next town, but the health officer has to "face the music." The truth is sufficient. It is interesting. It is not necessary to stretch it to get results. *Truthfulness*, *Brevity*, *Simplicity*, *Attractiveness*, are the cardinal requirements of all good publicity.

# CHAPTER XVIII

## PUBLIC HEALTH LAW

There are a few simple facts as to the legal powers, duties and limitations of health officers which can be expressed in uninvolved language, and which every health officer ought to know as a part of his equipment for his job.

Most of us have forgotten what we learned in school about the Constitution of the United States, so to begin our discussion it will be well to recall a forgotten point. The Tenth Amendment says, "The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people." One of these powers, which is reserved exclusively to the States, save in exceptional cases hereafter referred to, is the so-called "police power." This power authorizes the States to regulate for themselves and their own welfare, as they understand it, their purely internal and domestic affairs. It is a power designed for the protection of the lives, health and property, and for the comfort, convenience and safety of their inhabitants, and is the broadest reservation of power reposed in the people. It is characterized as an attribute of sovereignty.

Under this power all manner of restrictions are cast about our individual freedom of action, in respect of both our persons and property, in order that the greatest liberty and safety be assured to all. Public health laws and regulations are a part of this police power. As has been noted, police powers, and therefore health regulations, are reserved to the individual action of the several States, in so far as they concern affairs within each state. However, when a healt hmatter is of "interstate" concern, the Federal government has power of intercession, and in *purely interstate matters* its jurisdiction is exclusive.

As a result of this reservation to the States of the power of health regulation, we have no uniformity in either methods or effectiveness of public health work, as between States. Each state is a law unto itself, and may have just as good or just as poor health laws and administration as it wishes to pay for.

It has been generally held by the courts that, since the Constitution has reserved this power of health regulation to the States, therefore, all health matters are primarily State functions, rather than local (county or municipal). Intrastate health matters are conceded to be not essentially local, but of concern to the whole State. Furthermore, the local governments (county or municipal) in most States, are simply subdivisions of the State, created by the Legislature, having only such powers as the Legislature may delegate to them. Therefore, while local health officers are appointed and paid by a subdivision of the State to enforce the laws and regulations locally, they are under the supervision and control of the State in many particulars. The Legislature may properly prescribe the manner of appointment of local health officers, and cause the expenses of their work to be a charge against the county or municipality. This sometimes leads to difficulties and dissentions, as local governments often desire to run their affairs without State interference. But in the end, the necessity and propriety of central (State) control over local health officers is generally upheld by the courts.

Under the operation of State statutes, we see three principal lines of public health work authorized or required. Of course, measures for the control of communicable disease represent one line. Here we find the requirements of notification to the health authorities of the existence of cases or the occurrence of deaths, though the latter are required to be registered for legal as well as public health purposes. We also find the power of inspection of persons to determine either the existence of disease or the nature of a suspected communicable disease. There is also the power of isolation of the affected individual and quarantine of persons who have been exposed.

There are some limitations upon these powers, however. For instance, a health officer could not go up to any person he met on the street and say "Here, I want to examine you." However, the health officer may enter the premises of an individual for the purpose of making an investigation, and he may isolate any person, where there is reasonable suspicion that such person is affected with a communicable disease. Moreover, there need be only a *reasonable* suspicion for such action. If the person is to be isolated, there should be at least a reasonable demonstration that he is infected with a communicable disease. A physical or laboratory examination should be the foundation of such a demonstration. If a person refuses to permit a physical or laboratory examination, he may still be isolated upon a reasonable suspicion that he is infected with a communicable disease. If a person is to be quarantined, it must be shown that he has been exposed to a case of communicable disease, or presumably so exposed, and that it is reasonable to suppose that he will shortly develop the disease.

A person wrongfully isolated or quarantined can obtain release by applying to the proper court for a writ of "*habeas corpus.*" Further, he may sue the health officer for damages, if such official has failed to follow the statute, and has therefore acted beyond his official powers. Wrongful isolation is no ground for damage against the health officer if the isolation be perfected according to the means specified by the statute. So a health officer who acts in accordance with the law, and upon reasonable grounds, need not fear a suit for damages. Even if he has made a mistake, provided that he has done so honestly and without malice, and has used reasonable care and skill in his diagnosis, the courts ordinarily are not apt to assess damages against him. But if he has exceeded his legal authority, or has acted without good reason or reasonable competency or has been neglectful of the welfare and safety of the person isolated or quarantined, the health officer is personally liable for damages resulting. The city, county or State is not liable for the illegal acts of its health officers. If the health officer is prosecuted in a criminal case or sued for damages, on account of an illegal act, he must pay his own expenses for defense, as the city or county cannot legally defend him.

After communicable disease, comes the subject of things which may affect the public health. These matters are generally considered legally as "nuisances." A nuisance is, in general, anything which is injurious to health, or offensive to the senses, or which interferes with comfort and enjoyment of life. We must carefully distinguish between public nuisances and private nuisances. A public nuisance is anything which affects injuriously a considerable number of people. A private nuisance is one that affects only one or two people. For example, if John Smith established a hog-pen in a New York tenement house, it would be a public nuisance, as perhaps several hundred people would be offended. But if the same John Smith, out in the country, built his hog-pen next to neighbor Jones' house (there being no other farm-houses nearer than several hundred yards) it would be a private nuisance. A public nuisance may be also a private nuisance under certain conditions. The abatement of nuisances has been treated in the chapter on Wastes Disposal, Sanitation and Housing.

Some things that are generally considered nuisances, as for example manure piles or open privies, may be prohibited by legislation, and in that case a penalty for maintenance is usually imposed. Where a penalty is attached, the best method of procedure is to bring a criminal action against the offender before a court having jurisdiction.

Finally, there are various lines of public health work which are comparatively modern in origin, and were not thought of in the old common law. Such things as school medical inspection and the more advanced venereal disease control measures, are examples. For these, direct legislative authority is essential, although this authority may be couched in very general terms in defining the powers and duties of health officials, or may be given in distinct terms and sharply defined and limited.

Every health officer should carefully study, first, his State health laws and regulations, as the principal sources of his powers and duties, and should then examine his local ordinances. Then he will know definitely his powers and his limitations. For his own safety he should know the latter as well as the former. It is a good plan to consult with the district, county or city attorney occasionally, and always to consult him when not entirely certain as to the legality of a proposed procedure.

Litigation should be avoided as much as possible, as it is usually an unsatisfactory method of getting results. It is best to proceed on the assumption that of course "Friend Smith" intends to obey the law, that he has simply forgotten that such-and-such is the law, and intends to comply at once now that you have reminded him. Once in a while, however, one will encounter "Grouchy Jones." Kind advice and words get no results with him. With sorrow in the voice, tell him that one would hate to be unpleasant and have to cause his arrest, but really one cannot play any favorites and let him "get away with it," while all the neighbors are obeying the law. If that does not move him, never threaten arrest. If every polite means has been exhausted, file a complaint and get a warrant of arrest. And once legal measures have been started, go through with them vigorously and without compromise.

It is surprising how much can be accomplished in enforcing the law if one uses tact, combined with firmness. There will, however, always be a residuum of "tough nuts" which can be "cracked" only by legal measures. A few successful prosecutions of such cases, especially if conducted with dignity and without evidence of personal feeling, will greatly raise the public's estimation of its health officer, and make his work, easier and more pleasant.

## CHAPTER XIX

# THE ORGANIZATION AND FUNCTIONS OF STATE AND FEDERAL HEALTH AGENCIES

Both federal and state health agencies have for their aims three general objects to be accomplished: the prevention of the entrance of disease into the nation or state; the prevention of the spread of disease from one state or community to another, and the prevention of disease in the individual. Usually, the health work in the states is concentrated in one agency, but the carrying out of health work by the federal government is divided among a number of bureaus in several different departments. For example, the federal registration of births and deaths and statistical work relating thereto is carried on by the Bureau of the Census, in the Department of Commerce; food inspection and the sanitation of milk supplies are under the direction of the Department of Agriculture; and, until comparatively recently, the greater part of federal activity concerning child hygiene was centered in the Children's Bureau of the Department of Labor, and in the Bureau of Education of the Department of the Interior. There has been an awakening of late, however, to the need for a federal Department of Health, into which all of the agencies now dealing with health problems would be gathered, and the day is not far distant, perhaps, when such a department will be created. Economy and efficiency are becoming so urgent, as taxes mount, that the demand for centralization of authority and avoidance of duplication and unnecessary overhead expense cannot long be withstood.

Health administration in the country as a whole is further complicated at present by the lack of uniformity in state organizations and laws, resulting perhaps in large part from the reservation by the Constitution of the power of regulation of health matters, within the states, to the states themselves. There has been a tendency for some time, however, toward overcoming this lack of uniformity, through the efforts of organizations of state health authorities, the Public Health Service and national agencies of a non-official character.

The United States Public Health Service, which exercises most of the health functions of the federal government, is a bureau in the Treasury Department. It was first organized in 1798 as the Marine Hospital Service for the medical care of seamen of the merchant marine. Later, it was assigned the duties of maintaining the national and interstate quarantine service. In 1902, the name was changed to that of the Public Health and Marine Hospital Service, and in 1912, when additional powers and functions were authorized by the Congress, it assumed its present designation.

The organization of the Public Health Service may be briefly outlined as follows:

The Surgeon General
Division of Scientific Research
Division of Foreign and Insular Quarantine and Immigration
Division of Domestic Quarantine
Division of Sanitary Reports and Statistics
Division of Marine Hospitals and Relief
Division of Personnel and Accounts
Division of Venereal Diseases
Inspection Service
Section on Public Health Education

Purveying Service
Chief Clerk

The Surgeon General is appointed by the President, from the regular commissioned corps, with the consent of the Senate, for a term of four years. He has direct supervision over the activities and personnel of the entire Service. The chiefs of divisions are selected by the Surgeon General, from among the commissioned personnel, and have the title of Assistant Surgeon General while on special detail as chief of division.

The functions exercised by each division of the Service are as follows:

1. Division of Scientific Research. Laboratory and field investigations of man and domestic animals; includes the Hygienic Laboratory at Washington. The research work performed includes not only communicable diseases, but also occupational diseases, pollution of streams and coastal waters, rural sanitation, sewage disposal, child hygiene, and control of the manufacture of serums, vaccines and pharmaceuticals.

2. Division of Foreign and Insular Quarantine and Immigration. The prevention of introduction into the United States of communicable diseases from foreign countries, through examination of immigrants and passengers on vessels or trains, at points of entry.

3. Division of Domestic Quarantine. Interstate traffic and migration of diseased persons; plague suppressive measures on the Pacific Coast and in the Gulf States; water supplies used in interstate traffic; sanitation of National Parks, and cooperates with state and local health authorities in suppression of epidemics.

4. Division of Sanitary Reports and Statistics. Collects, tabulates, interprets and publishes morbidity data from the various states, and from foreign countries.

5. Division of Marine Hospitals and Relief. Maintains the various marine hospitals of the Service, for the care of disabled seamen.

6. Division of Personnel and Accounts. Detail and assignment of officers, and the accounting work of the Service.

7. Division of Venereal Diseases. Federal allotment to states for cooperative venereal disease control work; educational measures against venereal diseases.

8. General Inspection Service. Inspection of Service and Contract hospitals.

9. Section on Public Health Education. Publication and distribution of public health pamphlets, press releases, lantern slides, etc.

10. Purveying Service and Chief Clerk. Purchase and issue of supplies and equipment; records; mails and files; communication.

While we have seen that the federal Public Health Service is distinctly limited, by the Constitution, as to matters within the states, yet the states themselves, as to their health powers within their own borders, are practically unrestrained, except by general limitations of the common law, or special restrictions imposed by the constitution of the state. This power of the state is supreme over both cities and counties, as such political subdivisions are as a rule merely creations of the state, established by statute, and their powers and duties may be modified, enlarged or taken away by act of the legislature. All local health legislation (municipal or county), therefore, is subordinate to state health legislation, unless otherwise provided in city charters.

Very generally, for the sake of uniformity of procedure and effect, the states have established some means of centralized control over the health affairs of local communities, and also a uniform system or code of health laws and regulations. But, inasmuch as a constant stream of new facts and discoveries are being added to sanitary science, and because statutes are inflexible and not easily changed, the states have found it desirable, in many cases, to have the legislature pass acts giving only broad powers and duties to a subordinate board, usually termed the State Board of Health.

Such boards can meet more often than the legislature, may be selected for special knowledge of public health matters, and so may legislate, by means of regulations made within the limits permitted by statute, more intelligently and more in detail than it would be possible or expedient for the legislature to do. The details of their regulations can be readily changed to keep pace with new scientific knowledge or new conditions. The functions of such boards are therefore quasi-legislative, and also usually quasi-judicial, in that these boards usually have power to hear and decide complaints, appeals and petitions in respect of the public health.

Often such boards have executive functions as well, but this is bad administrative practice. Lord Bacon truly said "There be three parts of business: the preparation; the debate or examination; and the perfection. Whereof, if you look for dispatch, let the middle only be the work of many, and the first and last the work of few." This ancient truth is well exemplified in our corporations which, while they entrust the general policy of the corporation to a board of directors, nevertheless place the responsibility for getting results on one man, the general manager.

State Boards of Health, having executive functions, often delegate the duty of administration to one of their members, who is generally called the secretary. But the best plan, from an administrative standpoint, is to have the executive office separate from the board. In New York this has been carried to the logical extreme by having the Commissioner of Health the actual head, and the Board merely advisory to him.

The functions of state health departments are often, as are the functions of the federal Public Health Service, misunderstood, even by some who are employed in the work. The legislatures have usually, and with wisdom, required each local community to enforce health laws and regulations within its jurisdiction. If the state were to attempt to carry on the details of local work from a central office, three untoward conditions would arise: first, the necessary general direction and supervision would be hampered or even overwhelmed by a mass of details; second, local interest and responsibility would be weakened or destroyed; third, there would be danger of inflexibility and inadaptability to varying local needs and conditions.

The real purpose of a state health department should be to supply a means of securing uniformity, within reasonable limits, and efficiency of local health administration; to supply expert direction to local health administration; to provide for those health matters which local communities cannot effectively handle, or which affect the interrelation of local communities; and to anticipate, meet and cope with emergencies.

The principal functions of state health departments may be grouped as follows:

1. Direction and Supervision of Local Health Officers.
2. State Registration, Analysis and Interpretation of Vital Statistics.

3. Promulgation of Uniform Health and Sanitary Regulations.

4. Investigation and Control of Epidemics.

5. Supervision of Water Supplies, Sewage and Wastes Disposal, Housing and other Sanitation.

6. Supervision of Food Supplies.

7. Maintenance of Public Health Laboratory Facilities.

8. Promotion of Maternal, Child, Infant and School Hygiene.

9. Special Investigations into Health Conditions and Causes of Mortality and Morbidity.

10. Public Health Education and Publicity.

11. Expert advice to local communities on public health matters.

12. Point of Contact for Cooperation with Outside Agencies, as the National Red Cross, National Tuberculosis Association, U. S. Public Health Service, etc., and for Reciprocal Relations with Other State Health Departments.

A few of the above points may be briefly expanded.

1. Direction and Supervision of local Health Officers.

It is highly desirable that local health officers be subject to reasonable control and direction of the state health authority, for best results to the state as a whole. This can be accomplished to some extent by requiring through statute that local health officers shall enforce within their jurisdiction all state health laws and regulations, and all orders of the state health executive. And if the state health department can be kept out of politics, it is advisable to have appointments and tenure of office subject to approval of the state health executive. This latter provision helps to prevent the appointment of incompetents, and to remove the drones and ineffectives.

2. State Registration, Analysis and Interpretation of Vital Statistics.

Unless administered from a central state office, the registration of births, deaths, marriages and morbidity would be irregular, uncertain and usually inadequate. Furthermore, local communities are unlikely to obtain personnel trained in the analysis and interpretation of these data, outside of large cities.

3. Promulgation of Uniform Health and Sanitary Regulations.

It is of the utmost importance that at least in general outlines the health and sanitary regulations should be uniform over an entire state. If each community were permitted to adopt its own regulations the confusion would be great indeed, and what is permissible in one town might be forbidden in an adjacent city. Certainty and uniformity in these regulations is both desirable and essential for successful health administration within a state, and is of benefit to the local community as well as to the state as a whole.

By an exchange of information and the results of practical application of regulations, in time we should obtain a substantial uniformity between the several states, which will be a distinct gain in health administration.

4. Investigation and Control of Epidemics.

Theoretically, local health departments should prevent epidemics. Practically, through present conditions of inadequate funds and lack of properly trained personnel (as well as fortuitous circumstances beyond reasonable control) epidemics do get started, and if of large proportions may spread beyond the ability of local health departments to control. The state health department should be able to mobilize its resources promptly for local assistance in such cases, and should thoroughly study each outbreak to obtain information by which similar outbreaks in the future can be prevented; to advance general epidemiological knowledge, and to train its own personnel and the local health officers to a greater practical effectiveness in emergencies.

5. Supervision of Water Supplies, Sewage and Wastes Disposal, Housing and other Sanitation.

Much of this work is of a specialized technical nature, and local communities (as a rule) cannot employ the skilled personnel necessary. Also, these problems are often of an inter-community nature. For this reason the state should maintain the necessary staff of specialists, whose services are freely available to the local communities in solving their individual problems.

Especially in respect of the engineering phases of public health work, where large expenditures may be involved, and often where there are inter-community relations, the state health department should have a large measure of control and the final approval of any project should rest with it.

6. Supervision of Food Supplies.

For the benefit of the producer especially, but also for the ultimate benefit of the consumer, food regulations should be uniform, and enough supervision of local enforcement officials should be had to see that they are enforced in a uniform manner.

7. Maintenance of Public Health Laboratory Facilities.

The larger municipalities and counties should maintain adequate diagnostic laboratories in the local health departments, for the more common examinations. The state should maintain facilities for those portions of the state not so served, and in addition should handle special examinations such as rabies, Wassermans, etc., and should conduct laboratory investigations in rare diseases.

8. Promotion of Maternal, Infant, Child and School Hygiene.

This can only be effectively developed through the local health and school authorities, but the state should assume the general direction and stimulation of the local communities, and should aid them with exhibit material, literature, and special lecturers. It can also find its greatest usefulnes in making the broad plans for a campaign and in enlisting the active cooperation of other governmental agencies.

9, 10, 11 and 12. These functions are evident by their titles.

The emphasis which will be placed upon each of the functions will be determined by various conditions. Primarily they should be determined by a careful and intelligent study of the vital statistics of the state and its various subdivisions.

Above all else, the state department of health should be the agency which anticipates the health necessities and emergencies of the state. Through the assemblage and interpretation of reports and statistics, it should have available at all times accurate information as to the past and present health conditions of the state. From these it should not only determine present needs, but also future requirements, and especially should, as from a watch tower, spy danger from afar, warn of impending outbreaks, and set control machinery in operation before an epidemic or other danger has an opportunity to begin its deadly work. Such dangers seldom materialize without warning. Intelligent study of adequate information will show the signs of danger in time to take measures, just as properly correlated business statistics give warning to the keen business executive of the tendency of trade and finance. Few states, if any, have attempted as yet to fulfill this function, and none as yet has attained any conspicuous measure of success. This is a development of the future which is pregnant with possibilities for good.

## CHAPTER XX

# PUBLIC HEALTH AND SOCIAL WELFARE

Every one who uses terms should be placed under the necessity of defining and limiting them accurately, so that his hearers may know exactly what he means. We feel that we ought to be under the same necessity in using the much abused term "Social Welfare," but plead guilty to an inability to do so in a manner satisfactory either to ourselves or to the so-called "social workers." It would be a rash definition which would place a limitation upon something which has not yet developed toward a point of limitation, for much social welfare work still seems to be groping in the dark toward objectives as well as methods. But for our purposes, a very general and by no means accurate definition of social welfare work is the sum of all those collective activities of human society which have as their purpose the improvement of the living conditions of individuals or families in their relations with society as a whole. Under such a definition, it is obvious that both education and health are included, as well as many other things.

When we consider the various factors which affect directly or indirectly the public health, we begin to realize that public health is more or less inter-related with a number of other social phenomena. Whether we reason deductively from a generalized definition, or inductively from a number of observed phenomena, we are brought to the conclusion that public health is an integral and essential part of the public welfare.

Let us consider a few of the social factors related to public health. Economic condition is believed to exert a marked effect upon the public health. One prominent health worker has stated that probably the greatest single factor in improving the health of the nation would be a doubling of wages. Of course this is an economic fallacy, as a doubling of wages would mean a material increase in money, and therefore in prices, without increasing the nation's real wealth. But the statement indicates a frequently held opinion. Another statement, which has been prominently made in recent years, is that as the family income increases, the infant mortality rate decreases; the inference is that poverty is the cause of infant mortality.

But because two phenomena occur at the same time, it is not proof that one is cause and the other is effect. The real cause may be something else. It is very doubtful indeed if poverty is in itself the fundamental cause of excess sickness or mortality. For example, English statistical experience has shown that the group of agricultural laborers, which is about their lowest paid class, is apparently one of the healthiest groups in the nation. Statistical investigations of family groups have shown a striking relation between longevity in parents and a low infant mortality rate in their children, this relation holding true even under conditions of extreme poverty and hardship.

Therefore, it is not safe to make too positive a statement in regard to economic condition and public health. The two seem to have some relation, but a direct relation of cause and effect is not proven. Economic condition is probably of indirect influence, in that poverty may compel people to live under distinctly unfavorable environmental conditions.

We have many racial and national groups in our polyglot population. A study of these groups reveals the fact that certain diseases are more virulent in some of these groups than in others. This is both a social and a health problem of great interest. As an example, take tuberculosis. Its mortality is much higher among the negroes and Indians than among the whites (Hoffman has shown that for the Navajo tribe it is approximately ten times the rate for whites in the Registration Area). As we indicate in the chapter on "Heredity and Health," this is probably due to the longer racial experience of the white race with the disease, and the consequent survival of the more resistant strains; the native races not having had so long an experience, the process of natural selection is proceeding at a more rapid rate.

The same phenomenon may be observed, with the relative racial positions reversed, in respect of certain tropical diseases, such as malaria, for example. The colored races are relatively rather tolerant of infections which are highly virulent in the whites.

In the field of infant mortality investigations have shown that there is a differential mortality between the children of native-born mothers and of foreign-born mothers, and that the rates vary to some extent in the different national groups. How far this may be due to racial hereditary factors, and how far to factors of national custom, has not been determined, but here is a social and health problem of interest.

Alcoholism may, in the future, cease to be a social problem. In the past, it has been at times advanced as a health problem, and there is ample evidence that the considerable use of alcoholic beverages has had a detrimental effect on health. But the controversy on moral and economic grounds has obscured the hygienic aspects of the matter, so that the effect on public health of this social phenomenon has never been sufficiently realized by the public.

Prostitution is another social phenomenon the public health importance of which has only recently begun to be appreciated. The evidence that it is an important, if not the principal, source of venereal disease, is almost overwhelming. We are referring, of course, to commercialized prostitution, without necessarily including all sexual promiscuity. Previously, prostitution has been attacked and defended only on religious, social and criminal grounds. But it is now being treated as a health problem of the first magnitude, and we are beginning to see visions which indicate that ultimately the public health viewpoint and method of attack may conquer this ancient evil. Perhaps nothing else shows so well as prostitution the close interrelation of other social factors with health. Considered simply as a moral issue, the fight against the evil has not been productive of great result until public health methods were brought to the attack. As a corallary, possibly we shall not obtain material success with some of our health problems unless we consider the various social factors involved.

We have passed through that stage of human development when the sources of communicable disease were believed to be in our environment. We are now beginning to place the proper emphasis on man himself as the source of the diseases of man, without neglecting those environmental conditions which have an important bearing on the communication of disease from one individual to another, or which affect the susceptibility or resistance of the individual. A reference to fly-borne typhoid, malaria, plague, hookwork disease and pneumonia is sufficient to make clear our meaning. We have succeeded in more exactly evaluating environmental factors. But have we yet considered that environmental conditions may be essentially due to social and economic factors? Have we properly taken those factors into account in handling unsatisfactory environment? There is apparently a vast amount of indeterminate illness and reduction of physical efficiency which is related to defective environment. It is doubtful if any real progress can be made in treating such illness until the adverse environment is corrected. Few realize the vast amount of mere palliative medical treatment which is made utterly useless because the patient must still remain subject to unfavorable environmental conditions. Here we find medical, social and health problems closely interrelated.

Gradually, our more progressive sanitarians are realizing that public health cannot be most effectively considered apart from other matters of public welfare. We are beginning to use the methods of applied social service, by trying to reach the individual directly with teaching and demonstration, through the mediums of health clinics, health centers and public health nurses. But most of us have yet to realize that communicable diseases are but a part of the whole problem of public health, and that an adequate health program must reach the fundamental causes of mortality, ill health and reduced physical efficiency. The final step will be to coordinate all social welfare work, including public health, for the reason that there is an interdependence of the various parts, and the greatest result for the least expenditure requires correlation of effort.

All this may seem strange doctrine to many who have heretofore considered public health to be a matter of purely medical aspect. But medicine itself is really a social service. The conception of public health service has so broadened in recent years that its purely medical phases are now considered of secondary importance.

Yet, while we should recognize the larger social aspect of public health work, and correlate health activities with programs of social welfare, there is a danger that the pendulum will swing too far in the opposite direction. We must guard against submerging public health work in a mass of other welfare work. There has developed a tendency for social welfare workers to usurp the proper functions of health departments. This tendency is particularly noticeable in the field of child hygiene wherein, if successful, it would take away nearly one-third of our opportunity of reducing the general death rate.

The reason for this usurpation has, in some instances, been the failure of the health authorities to measure up to their opportunities or their duties. There has been, to some extent at least, a failure due to an inadequate and not sufficiently comprehensive program. This condition will not be remedied, unless health officials develop a wider social vision. We need very badly to develop techincal expertness among health officers, but still more do we need the development of sanitary statesmanship. When our health officers are selected and appointed because they are broadly educated as well as intensively trained in public health work, then our health problems will be studied as social problems, not as narrow medical problems, and logical and effective preventive measures will be applied. There is a vast accumulation of public health knowledge not utilized for lack of a broad program and sufficient leadership for making it effective. When our health officers generally recognize the social aspects of public health work, then will there be comprehensive programs of health improvement applied under inspired leadership. The possibilities of success are perhaps beyond even our dreams, but the hope of today may become the accomplishment of tomorrow.

## CHAPTER XXI

## THE FUTURE OF PUBLIC HEALTH

Until recent years, public health practice has paralleled closely the evolution of medicine. A long struggle with "miasms" ended rather sharply with the discoveries of the early bacteriologists. Their work threw a brilliant light upon the etiology of infectious disease, which had lain shrouded in a haze of conjecture. Gradually the conception took form that as a source of infection, man was more important than his environment, and it naturally followed that the control of the case, the carrier and the vector, together with methods of immunization, became the chief concerns of health officials. In order to safeguard the welfare of the community, government assumed an ever increasing supervision over the conduct of the individual as it might affect his fellows, and today we find the broadest possible power conferred upon health authorities to delve into intimate details of personal conduct, as well as to regulate communities *en masse.* With a better understanding of some of the factors involved in disease production it has quite logically followed that early preventive measures should supplement those of suppression only. First by private enterprise and later by government, there have been developed those activities that make up a large part of modern health work, such as child welfare, prenatal care, school hygiene and life extension. Even more advanced is the experiment now being conducted on a national scale in England, that of health insurance with all of its possibilities for complete preventive and curative medical care for the individual. Observing the trend of events in the history of public health practice and stimulated by the rapidly growing interest of the scientific and lay world in such matters, we can safely outline some of the next steps that should be taken, as well as venturing a look into the more distant future.

Birth, death and morbidity returns are fundamental to any modern health program, yet the states in the Registration Area are required to attain only 90 per cent. of perfection. What of the other 10 per cent.? Until every case is reported, until every birth and death is recorded, these statistics, that are truly vital, will lack the complete accuracy they demand. Furthermore, when certificates of birth and death continue to come to the desks of registrars with every essential item missing or grossly irregular in form, there is obviously vast room for improvement at the very foundation of our health work. It is not too much to expect that the well trained physician of the future will take as great pains with his reports as he does with his diagnosis or his operative technic; for he will have been taught an appreciation of the real value of vital statistics.

Control of communicable diseases marked the starting point of public health practice. Through the years knowledge has increased, until epidemiology now assumes the dignity of a science. Yet influenza, measles and scarlet fever, to name a few examples, baffle the skill of the health officer. An enticing field of research into these undiscovered realms awaits the investigator of the future. Day by day the pathologist adds to his store of isolated facts, but the science will eventually produce a genius who will formulate those fundamental laws that are needed to explain the observed phenomena and to open up wider fields of investigation. Intensive and extensive research in bacteriology and pathology must be continued if we are to gain a better understanding and control of infectious diseases.

Thanks to concentrated study, our knowledge of the veneral diseases has reached an advanced stage of development. They have been examined not only from the standpoint of pathology and epidemiology, but from that of sociology, of psychology, and of ethics, as well. The next generation should see a marked diminution in the ravages of these world-old infections. It is a challenge to our coming health officers that they cannot ignore, for they have the tools at hand with which to mitigate this scourge.

Everywhere we see figures that point to growing morbidity and mortality from accidents. While much has been accomplished in the industrial field, a sudden accession of business activity is usually marked by a high accident rate. In the streets of our cities life is held too cheap. If the modern health officer is to measure up to his duty of reducing all preventable mortality, he must join with the safety engineer and the traffic director in attacking this urgent problem.

No phase of public health activity makes such popular appeal as the preservation of infant life. The right of every baby to be born well and to acquire vigor of mind and body is nowhere denied. Yet the lowest infant mortality rate is still well over thirty. Coordination of agencies for prenatal care, maternal nursing and child welfare will do much to reduce this mortality to a minimum. But there is needed also a better understanding of those factors that influence the prenatal and puerperal states and of their effect on the infant.

Leaving the subjects that have received our principal attention, during this developmental period, let us examine that fertile and untilled field—the chronic, degenerative diseases. Here we find over 25 per cent. of our mortality, and practically no effort being made to cope with it. Dr. Theobald Smith has recently said, "Since science is valued in proportion to its value to predict successfully certain events, medical science will be judged by the way it takes hold of a new phenomenon to determine its etiological antecedence. If, in the course of its development, it has failed to take cognizance of factors necessary to build the science into a consistent whole, it should retrace its steps and make up the deficiency."

While the class of affections just mentioned cannot be considered as new phenomena, they have certainly been neglected by medical science in its preoccupation with those problems that offered a more ready solution. Yet the health officer cannot afford longer to disregard this hiatus in the continuity of his work. What has been done for disorders of the heart by Sir James Mackenzie[1] must be as carefully evolved for other chronic conditions and we must go even further, if a real conception of the "etiological antecedence" is to be achieved. Such an undertaking is not so formidable as it may appear. Agencies similar to the Life Extension Institute and the great insurance companies might unite in a thoroughgoing study of a large group of persons from the commencement of prenatal life until death, keeping in constant touch with each individual, minutely recording every phenomenon of his growth and moribdity, examining him at frequent intervals for the least departure from "normal." With this mass of data in hand, it would be possible to evaluate the etiological significance of symptoms that are now overlooked or disregarded. Thus the physician and health officer could predict the onset of disease that is not now recognized until it has produced a gross pathology. The

[1] Mackenzie, Sir James: The Future of Medicine, Oxford University Press.

next step would be to correct the conditions that were responsible for the early symptoms; in other words, to attack the disease in its curable stage or to prevent it entirely. Is this asking too much, if preventive medicine is to be true to its name?

The same procedure might well be adopted in an attempt to discover and eliminate the immediate and remote sequelae of acute infectious disease. At present we have little information upon this important phase of public health. Dr. Isaac A. Abt has expressed the thought in his paper on "Sequelae of the Communicable Diseases of Childhood as a Public Health Problem." He says, "It is possible that the public health officer is interested in the sequelae of disease because whatever tends to the production of chronic invalidism, whatever deteriorates the health of citizens or incapacitates them for their normal vocations, may affect the physical, moral or mental status of the people, and may become an economic, a social and a state problem which would call for the most thoughtful consideration of public health officials."

Increasing difficulties beset the public health engineer, as our population becomes more dense. Abundant pure water and ample sewage disposal at moderate cost are problems that are pressing for solution. Not only are the large urban areas involved, but the rural and semi-rural districts are becoming more thickly settled, with the consequent question of effective sewage disposal growing more insistent. Cheap and efficient standards, suited to varying conditions, must be worked out and vigorously applied. An open privy should become a matter of public concern in any community. How far from this ideal is the average American village of today!

Concentrated populations increase immensely the difficulties and expense of food-handling. For the city dweller of small means to secure a properly balanced diet is a serious tax upon his income. Especially is this true regarding milk of wholesome quality. It must be the concern of health authorities to cooperate with other agencies that are striving to secure adequate and safe food supplies for all classes of the community. Undernourishment, with its train of ills, is a constant finding among the school children of the land, lowering, as it does, the physical and mental average of our citizens. Coupled with better food supplies must go popular education in the composition and preparation of foods and a better public understanding of the requirements of the body in this respect. Who is in a more advantageous position to give this information than the officials who are charged with the care of the public health?

As an illustration of the lead that is often taken by non-official agencies in initiating a public health movement, we find that the greater part of the present agitation for a better understanding of mental hygiene is fostered by persons not directly connected with organized health work. If our ideal citizen is one who has health of both body and mind, it is high time that the health officers of the country became more familiar with this subject. It is not enough to stop with the physical examination of a school child. His mental tendencies should come within the general survey and those that are indicative of mental disease should receive as careful attention as his adenoids and tonsils.

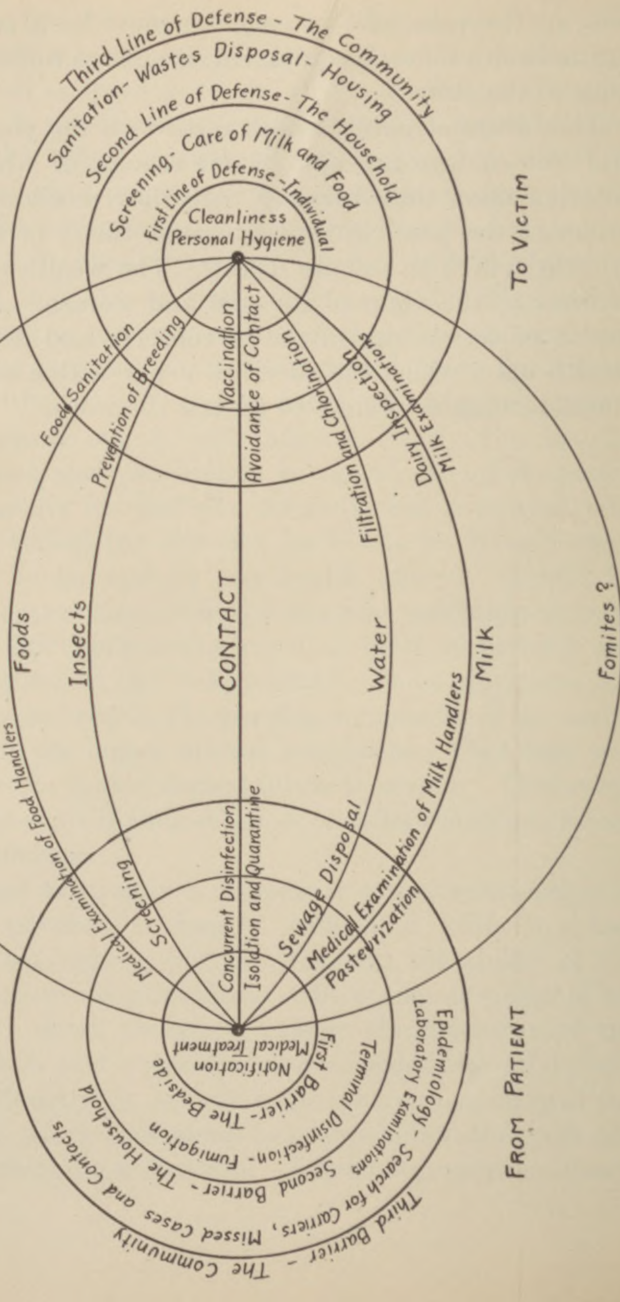
To those engaged in the work it is quite evident that public health administration in its broadest sense is a highly specialized profession. The medical man, with no other training than that received in the average medical school, is no more equipped to assume immediately the duties of an efficient health officer than to become at once a finished surgeon or an ophthalmologist. The so-called courses of "hygiene" in many of our medical schools are a waste of time. There is not even a hasty survey of the field and the student emerges with a hazy idea that public health and hygiene consist in the measuring of the cubic feet of air in a room and perhaps in the making of a few perfunctory reports. Yet the layman looks to the physician as mentor in all matters of health and sanitation. Is it any wonder that the public should fail utterly of comprehension? Our physicians must be given a broader outlook in the schools. Adequate courses in the whole subject of public health must become the rule, where they are now the exception. And these newer physicians must assume the role of teachers, combating ignorance and superstition with sound scientific fact. Thus aided, the health officer can carry his message to the public, knowing that it will not be neutralized by uninformed and misleading dogma from the professional men of his community, but rather that the public will have added faith in his teaching and will demand of him a high quality of training.

A natural sequel to enlightened public opinion should be the removal of public health administration from the blighting effects of petty politics. No man of professional attainments cares to hold office through such means. If qualified officials are to be had, their tenure of office must be secure and their operations unhampered by politicians of the narrow sort.

Thus briefly have we sketched the next immediate steps in the realm of public health. Some are already in the way of fulfilment, others are taking form, while a few are only here and there engaging the thought of earnest students. It remains to examine the present trends in public health practice in order to gain, if possible, an intimation of developments that may be expected in the future. Are we dealing adequately with the whole subject, or are we touching it at a few points only? Do we meet the problem of cure as well as prevention in anything like an effective manner? Is not the actually sick man of as much interest to the health officer as the potentially sick one? If so, is our present attempt to maintain an artificial demarcation between the two bringing us nearer to the kind of service that the state should render? If not, should the state undertake to treat as well as to prevent? England is already tending that way and there is agitation for something of the same sort in this country. De we not need a new definition of the proper functions of governmental health agencies which will indicate clearly the bounds within which such work shall be done? If public health practice has for its chief aim the reduction of mortality to its lowest terms, can the sick be left to haphazard care; can they be ignored by the health officer? Should he not have supervision over the physical wellbeing of mankind from the cradle to the grave, if he is to perform the highest service to the community? These questions are demanding answers in the growing complexity of our civilization, with its higher ethical standards. That they will be answered in the not distant future is certain. The health officer must share in their solution, or suffer the consequences of his indifference.

While not existing in a necessarily causal relationship to sickness, poverty is largely associated with it. Any measure that reduces poverty increases the ability of the sick to procure adequate care. The economic status of his community must, therefore, engage the attention of the health officer and enter into the consideration of betterments. Underlying poverty is the inherent capacity of the individual, which determines to a large extent the economic plane to which he will attain. A keen appreciation, therefore, of the principles of eugenics must be a part of the future health officer's equipment, if he is to fulfill his whole duty to the state.

The future of public health rests with the younger men and women who are now in our schools or who are just entering upon their careers. Are they receiving a broad vision of the possibilities that await them, or is it being crowded out with infinite detail? The wealth of a nation consists in the vigor of its men and women. Are future health officers being trained to conserve and develop that wealth upon which the survival of our nation rests in the coming struggles of man to possess the world?




Modified from Whipple's Figure

Sources and Modes of Infection
Preventive Measures

Diagram III

# PART II

# THE PREVENTABLE DISEASES

## PRELIMINARY CONSIDERATIONS

At the outset, one should become familiar with that sonorous word which delights the ear of the sanitarian, "epidemiology," literally, the study of epidemics, or the investigation of the nature, causes, modes of transmission, and control, of the communicable diseases. Armed with these data, the health officer is prepared to attack with certainty the problem at hand. Without them, he is firing in the dark, much as the medical empiricist applied his shotgun prescription.

In commencing his investigation, the health officer frequently makes the mistake of not confirming the diagnosis of a fellow physician. Ethical considerations becloud the conception of his obligation to the public. As a result, his subsequent course of action may be set at nought and an outbreak may develop, through failure to determine the true nature of a disease and to take proper control measures, when most effective. It is the duty, as well as the right, of the health officer to satisfy himself as to the diagnosis of any case that may come to his attention and to act upon his own conclusions.

Once the nature of a communicable disease has been established, it is essential that the characteristics of the specific organism, if identified, should be clearly in mind. For the physician-health officer who finished his medical training in earlier days a short review of the principles of bacteriology will reveal many of the underlying reasons for modern public health practice.

Knowing the nature and cause of the disease, the query should be, "How did it originate?" To the uninformed a case of infection often appears to arise spontaneously, without reference to anything else in the environment. We know, of course, that this cannot be true, for it is a fundamental law of bacteriology that most of the pathogenic micro-organisms must have a suitable host. Exposed to air, sunlight and drying, they perish rapidly. The theory of so-called "air borne" infection has been discarded in the light of modern bacteriology. Furthermore, when the source of infection and mode of transmission of such diseases have been carefully and accurately worked out, some human being, or animal, has always been found at the bottom of the trouble. While we do not know the specific organisms of some infectious diseases, as measles, scarlet fever or smallpox, yet their obvious communicability, coupled with the fact that carefully studied epidemics have usually disclosed the human or animal origin, lead us to the safe conclusion that they are of the same nature as those affections already solved. Furthermore, when we apply similar methods of control to them, they yield as readily.

What, then, are the possible sources of infection? (1) A sick patient, if there be one about, naturally comes to the mind, first of all. But often the solution is not so simple. (2) Many persons are so resistent as to show few outward signs of illness and even to be unaware of such a condition in themselves, beyond a slight malaise. Such "missed cases" are a fruitful source of infection in others and give the health officer no little worry. (3) Even more elusive is the "carrier," the person who has no symptoms of disease whatever, who may be in robust health, but who is harboring within himself the infective organism. One writer has said that modern public health practice dates from the recognition of the carrier. Such a one may, or may not, have had an attack of the disease which he is spreading. In some cases the carrier condition is easily demonstrable, as in diphtheria and typhoid fever, while in others it is merely a good working hypothesis. The experienced health officer will be always on his guard for the carrier. (4) Far more insidious than the attack of the human carrier is that of the insect that bears pathogenic microorganisms on or within its body. In this class malaria, yellow fever and plague have counted their victims by the millions. However, we must bear in mind that the ultimate source of infection lies in some human being, with the exception that plague may pass from rat to rat, as their fleas seek new pastures. While insects are usually regarded as merely channels, or "vectors," of infection, yet, for practical purposes, they may be classed as sources comparable with the healthy human carrier. (5) In a small group of diseases, animals are the original source of infection, as in rabies and anthrax. (6) Lastly, food gives rise to cases of poisoning, such as have received widespread publicity of late.

Logically, the next question for the health officer to ask himself is, "How did this disease travel from its original source in some other person, or animal, to the individual who is now sick?" It will be found, however, in practical application, that the sequence is often reversed. The mode of transmission is first determined and the source of infection then discovered from the accumulated evidence.

As a frontispiece to this Part will be found a figure adapted from an original sketch by Prof. G. C. Whipple (Diagram III). This presents quite graphically the avenues of infection and some of the barriers that may be erected across the paths. Degrees of importance in these lines of transmission are indicated by the lengthening arcs, with the straight line of "contact" taking the central and most important position. When we consider the mass of mild and missed cases of disease, often far exceeding the recognized typical cases, and when we add to these the many carriers that often arise in the course of an outbreak and from association with the sick, there should be no surprise at the established fact that contact surpasses all other modes in the transmission of infection in the majority of diseases. By contact is meant not only the direct, intimate association of well and sick, but the indirect transference of *fresh* infective material on the hands of other persons and upon inanimate objects. Note that the word fresh is used advisedly, for we must not confuse this important means of transmission with the discarded idea that various objects may hold the "contagium" in a dessicated state and for long periods of time. It is evident, then, that in most outbreaks of infectious disease, contact, direct or indirect, will explain their spread. Incidentally, it should be noted that the characteristic of an outbreak propagated in this manner is its comparatively slow development, as contrasted with the explosiveness of the usual massive infection resulting from contaminated milk or water.

Of second importance is insect transmission, which may be divided into biological and mechanical types. By the former it is meant that the infective organism must undergo a necessary part of its life cycle, usually a phase of sexual reproduction, before the insect is capable of transmitting the disease. On the other hand, flies may carry bacteria on their feet or proboces and deposit them on food, although the fly plays no part in the life cycle of the organism. While more varieties of disease are spread by contact, probably a greater total of cases, the world over, arise from insect transmission.

Water borne infection has long been recognized, but its relative importance is often exaggerated. The first thought of the uninformed, in the presence of typhoid fever, is that the drinking water must be polluted, while he overlooks entirely the convalescent case, or the carrier of long standing, in his kitchen.

Milk is frequently contaminated in the process of production, or in its preparation for the market. The characteristic of both water and milk borne outbreaks is their sudden onset, occurring, as a rule, among a large group of persons simultaneously. In a milk borne outbreak the largest percentage of cases will be found among the customers of one dealer, which will lead directly back to a case or carrier on the dairy. Outbreaks of typhoid fever, diphtheria and scarlet fever are frequently traced to such a source. Other foods handled by cases or carriers are sometimes the means of transmitting infection. Uncooked or underdone meats often contain living parasites.

The transmission of bacterial disease by air or by fomites has been repeatedly demonstrated to be highly improbable. When one considers the difficulty experienced by bacteriologists in maintaining living cultures of pathogenic organisms, it is scarcely reasonable to contend that such bacteria could exist, much less multiply, for long periods of time, when exposed to the effects of drying, light and changes of temperature. Experimental evidence, together with epidemiological data, have demonstrated that these two alleged means of disease transmission have little foundation in fact. One can, of course, point to the exceptions in anthrax and tetanus. However, both of these diseases are caused by spore-bearing organisms, which places them in a class apart from other pathogens. One might also mention hookworm disease, but here again is a specialized organism that is quite distinct from the ordinary pathogenic bacteria.

In all of the foregoing, such materials as garbage and weeds have been ignored. Even the ubiquitous tin can is missing. But the reason should now be clear. Aside from the garbage pile as a breeding place for flies, such things play no part in disease transmission, however unsightly or offensive they may be from the esthetic standpoint. While weeds sometimes offer a shady resting place for the mosquito, it will do no good to mow the lawn in order to suppress a typhoid epidemic, notwithstanding the convictions of many substantial citizens. If the time and money spent on "clean up" campaigns could be devoted to securing proper sewage disposal, safe water and screening for every home, infinitely more good would be accomplished for the public health.

To sum up in a word; emphasis should be placed upon the fundamental conception that it is **PERSONS, NOT THINGS** that are of primary importance in the origin and spread of infection.

In the figure under examination we have so far disposed of the central cord and group of arcs denoting modes of transmission. It remains to discuss the two sets of concentric circles which represent, on the one hand, control of the case or carrier and, on the other, means for protection of the well person. Since it is persons, not things, that interest the sanitarian in his attempt to control disease, modern public health practice throws a number of barriers about the person who is sick, or who is harboring pathogenic organisms in his body, in order to close the avenues of disease transmission that have already been considered. These barriers may vary in nature, according to the line of transmission peculiar to a particular disease, but are founded upon the basic principle mentioned.

If preventive machinery is to be set in motion, the health officer must know of the existence of a case or carrier. Notification, then, is the first step in control and the efficient health officer will bring to bear every means of education, persuasion and law enforcement to secure complete and immediate reports of notifiable diseases. He is also interested in obtaining adequate medical care for the sick, in order that they may be under better control and may be rendered non-infective as quickly as possible.

A plea must be entered here for more careful and accurate diagnosis of the communicable diseases. As has already been said, there are many more of the mild, atypical cases than of the easily recognized types, in most outbreaks. Physicians should be led to realize that, from the "text book" case to the person with practically no physical signs, almost any combination of mild or acute symptoms may be encountered and that no little diagnostic acumen is often required to arrive at a correct conclusion. The health officer ought to take the lead among members of the medical profession in stimulating a more careful study and revision of prevailing conceptions of communicable disease symptomatology. Furthermore, if a diagnosis remains obscure, after careful consideration, it should be borne in mind that "it is better to be safe than sorry." Duty to the public demands extraordinary watchfulness and an error on the safe side will never call forth the charge of neglect of duty. When in doubt, a provisional diagnosis and isolation as "suspected smallpox" or "suspected diphtheria" are better than to allow an "influenza followed by chickenpox," or a "tonsillitis," to roam at large.

The remaining measures of control, so far as the patient or carrier is concerned, are isolation of the person, as thorough as may be required by the nature of the case, together with whatever is necessary in the way of concurrent disinfection of discharges, secretions and of articles soiled with them. Disinfection is accomplished by burning or boiling the infective material, or by subjecting it to the action of chemical agents or steam under pressure. Especially important in bedside precautions is the instruction to the attendant as to proper cleansing of the hands, so that infection may not be conveyed to others in the household.

Outside of the sickroom, but within the house, certain measures must be taken. If the disease under isolation is one that can be carried by insects, the latter must be thoroughly exterminated, before they have opportunity to invade the sickroom. If the discharges from the patient and the utensils which he uses are not completely sterilized at the bedside, this becomes a task for the household. The health officer should give explicit instructions on the proper procedure and see that it is carried out.

As a matter of self-preservation, the community is interested in thoroughgoing control of the infected individual. To this end, it establishes health departments and spends greater or less sums of money, for the sole purpose of throwing barriers about the case of communicable disease. Aside from the functions of maintaining isolation and quarantine, the health department should make epidemiological investigations of all cases of communicable disease. In this connection laboratory tests are often needed, so that the provision of such facilities is an important duty of health departments. Since schools are a common breeding ground of infectious disease, school medical inspection should be demanded by every progressive community. In certain diseases one of the effective control measures is to treat the patient in order to render him non-infective as quickly as possible. This is well illustrated by the modern method of handling venereal diseases. Free clinics for such cases, as well as for tuberculosis, have become a part of recognized public health machinery.

Not satisfied with "watchful waiting," for disease to appear, the community goes farther, by attempting to block those channels through which infection may gain entry. This brings us to the right hand group of circles in the figure. Here the sanitary engineer finds a fertile field in providing safe water supplies, protected from possible pollution, or freed of such contamination by chemical and physical means. He also devises systems for the disposal of human wastes in such manner that their menace to the community is eliminated. His place is one of fundamental importance in the health department of every state and of all large cities.

As information on sanitary matters has become more general, protective measures against the introduction of disease have been almost unconciously adopted in the home. Screening, proper sewage disposal and greater care in the selection and preservation of foods, may be cited as illustrations.

Hand in hand with home and community sanitation, better personal hygiene has become a powerful factor in reducing the incidence of communicable disease. Through vaccination, smallpox has diminished markedly in many localities, while the typhoid fever rate of the Army speaks for the efficacy of prophylactic vaccination against the latter infection. We are also learning to avoid personal contact with the sick, although many of our rural communities still leave much to be desired in this respect.

Thus briefly have been noted the lines of transmission for the communicable diseases and the barriers that are erected in their way. Many of these topics will be given more detailed consideration in subsequent chapters. There remains for this general survey a discussion, in outline, of the practical ways in which these control measures may be applied to various types or modes of disease transmission.

It has been pointed out that contact is responsible for the spread of more varieties of disease than is any other single agent, and that contact may be of two kinds, direct and indirect. Also, it was shown that the infective material must be fresh to be really dangerous. Superficially, then, it would seem relatively simple to cut the line of communication in direct contact by isolating the case or carrier. However, as in the case of rabbit stew, "you must first catch your rabbit," so the isolation of the offending individual will often lead the health officer on a long hunt. However, upon his intelligent energy and persistence will depend the early control of many outbreaks. Together with the isolation of the case goes the quarantining of those who have been in contact with it, until the incubation period for the disease has passed. It should be noted that a distinction is made between isolation and quarantine; the former applying to the infected individual or the carrier, and the latter to the restriction placed upon contacts, which may be much less rigorous than isolation. In fact, the stringent quarantine of earlier days has been considerably modified, of late, due to the application of data derived from epidemiological research.

An important safeguard against indirect contact is concurrent disinfection, together with a thorough cleansing of the nurse's hands. Complementary to concurrent disinfection is terminal disinfection, which is merely the same process applied at the conclusion of the illness. If the former has been faithfully done, this latter measure is superfluous, but gives the health officer an opportunity to assure himself that proper disposal of fresh infective material has been made.

Some may ask why nothing has been said of the old standby, fumigation. For many years, this "incense has risen to false gods," due to the theory of fomites transmission and to the idea that the gaseous agents, as commonly used, were really destructive of bacteria. Investigation has disposed of fomites as agents in the propagation of disease. It also has been demonstrated that pathogenic bacteria are not completely killed by these gases, *when employed under the usual conditions.* Thus, there is no need of fumigation, since the bacteria will usually have died off in their unfavorable environment, and the ordinary application of fumigation is entirely ineffective, if any such organisms should remain. This measure may as well be abandoned, then, for it often engenders a false sense of security which encourages the neglect of procedures that will be of real value in eradicating the few bacteria remaining in an attenuated form.

While contact spreads more varieties of diseases, it has been stated that insects are the agents in producing far greater numbers of cases, the world over. Merely to mention malaria, yellow fever, plague and typhus, will make the fact obvious. Destruction of the breeding places of insects and other vermin is the ideal method of combating such diseases as they carry, but is not always feasible. However, insects can be prevented from reaching an infected individual by screening, by killing those that have gained entrance to the premises and by delousing measures. Furthermore, insects already infected can be denied access to healthy persons by the same means. In this connection fumigation has its real mission in the destruction of insects and vermin.

Water was considered in a separate chapter, so that it will suffice here merely to mention the fact that sterilized discharges, proper sewage disposal, a water supply uncontaminated, or protected by filtration and chlorination if necessary, and the boiling of drinking water, when under suspicion, will eliminate pathogenic micro-organisms which it might otherwise convey.

Another chapter deals with the care of milk, from source to consumer, in which the subject of disease transmission through milk is covered. Other foods are given more detailed discussion elsewhere.

Thus, in the most cursory manner, an attempt has been made to outline the fundamentals upon which modern sanitary practice is based. Many ideas have been suggested which may seem entirely too radical, to those whose studies have led them into other fields of science. Before taking exception to these propositions, however, the student is urged to examine the evidence upon which they are founded and to discover for himself that sanitary science has kept pace with medicine in its trend from empiricism to experimental investigation. A list of references will be found in the appendix.

Since this is not intended as a treatise on the practice of medicine, but as a simple guide for health officers, no large amount of space will be given to many aspects of disease which are important only to the medical attendant. As diagnosis concerns the health officer, points of differentiation will be stressed, when important. In addition, the principal topics discussed will comprise the infective agent, immunity, modes of transmission and administrative control. In passing, one term should be explained that will be used frequently, viz., "droplet infection." Diseases are not carried in the air, as that phrase is usually understood, but in a more restricted sense they are so transmitted, by a spraying into the air immediately surrounding the patient of the infective organisms which are found in the nose and throat. Persons within a few feet receive this spray, whenever the patient laughs, sneezes, coughs, or talks forcibly. Demonstration of this fact has been made by exposing culture medium at various distances from the subject and, later, indentifying growths of mouth bacteria upon it. These organisms ride upon the fine droplets of moisture thrown out and may so travel for at least ten or fifteen feet, before settling to the ground where they begin at once to dry and become inocuous.

## 1. ANTHRAX

**Infective Agent.**—Particular interest attaches to the specific organism, *bacillus anthracis*, for the reason that it was the first bacterium to be definitely connected with an infectious disease as the causal agent. It was discovered by Pollender in 1849, and in 1860 Davaine presented to the French Academy of Sciences his evidence which directly associated the bacillus with the disease. Koch and Pasteur, in 1877, isolated the organism in pure culture and the science of bacteriology was there firmly established.

The bacillus is one of the spore-bearers, which partly accounts for its persistence. It is also quite adaptable, growing at temperatures between 12 and 43 degrees Cent. Under 14 and over 43 degrees it does not form spores, nor can it do so in an atmosphere devoid of oxygen. This has a practical bearing upon the disposition to be made of infected carcasses. Lack of oxygen also explains the absence of spores in bacilli from lesions.

**Incubation Period.**—In man the incubation period is quite brief, initial symptoms usually developing within 24 hours after infection. For the intestinal type of infection, frequently encountered in animals, the period is slightly longer, due to the fact that only the spores can resist digestion.

**Immunity.**—So far as known, no natural immunity to anthrax exists in man. Artificial immunity in animals has been induced by means of attenuated cultures, but has not been tried on human subjects. Cats and dogs are rarely affected, but cattle, sheep, hogs, rabbits and guinea pigs are susceptible in varying degrees.

**Modes of Transmission.**—Man ordinarily acquires anthrax by handling infected hides, hair, wool or carcasses. Recently a number of cases have arisen from the use of new shaving brushes containing spore-bearing bristles. Occasionally a person may receive the spores in food or inspired air, but this mode of infection is infrequent. The organism gains access to the subcutaneous tissues through minute abrasions or larger wounds of the skin.

Animals are more commonly infected through the digestive tract by eating food bearing spores. The resulting intestinal form of disease spreads to all parts of the body before death.

**Diagnosis.**—External anthrax assumes two forms in man, the malignant pustule and malignant edema. In the former case a small furuncle develops that grows to large proportions quite rapidly, with a central necrotic area and surrounded by an extensive edema. Temperature may be elevated or may not rise noticeably. More or less toxemia develops and is probably the cause of death from the pustule. Malignant edema presents no single point of activity, but the disease spreads rapidly through the subcutaneous tissues producing extreme edema and toxemia.

Internal anthrax is more difficult to diagnose in its early stages, as the symptoms are not characteristic. Either the lungs or intestines may give evidence of an acute inflammatory process which may be mistaken for other conditions.

Reliance should be placed upon repeated microscopic examinations of discharges or scrapings from lesions. The bacillus is quite characteristic in appearance and, once seen, clinches diagnosis. In addition, culture media should be inoculated with presumably infective material, as growth can be secured in 24 hours at 37° C. If doubt still exists, inoculations of discharges into mice will produce a rapidly fatal infection.

History of probable exposure to hides, hair, wool or infected carcasses should always be sought in any suspicious case of furuncle, edema, pulmonary involvement or acute intestinal disease.

**Methods of Control.**—Every animal that dies of anthrax, or of suspected anthrax, should be completely destroyed, preferably by burning. If this is not possible, the body should be buried at a depth of at least six feet, in order to prevent access of oxygen and to secure a temperature unfavorable to spore formation. Infected hides are dangerous and should not be sold. Hair and wool from infected animals should be sterilized by steam under pressure, or by boiling, before they are handled.

All discharges from lesions in man, whether external or internal, should be sterilized by burning or boiling. During the acute stage, patients should be isolated, although the chances for transmission from man to man are rather remote.

A health officer receiving a report of a case of anthrax should immediately investigate to determine the source and should see that the animal or infective material involved is safely disposed of.

**Mortality.**—Only 28 persons died of anthrax in the registration area of the United States in 1916. Properly treated the disease is not extremely fatal. However, Scholl has recently pointed out that surgical treatment of external anthrax may do more harm than good and has entered a plea for more conservative handling of cases. Therapeutic serum, if used promptly, seems to modify the course of infection favorably.

## 2. BERIBERI

Beriberi is a disease primarily of the nervous system, a polyneuritis, or multiple peripheral neuritis. Its principal features are disturbances of motion and sensation, edema or atrophy, and, frequently, sudden heart failure. Geographically it is confined almost entirely to those nations which subsist chiefly upon rice. In the United States it is found among Orientals of the Pacific coast region.

**Cause.**—The combined observations of many investigators have demonstrated conclusively that beriberi is produced by a long continued deficiency in one or more of the so called "accessory food substances," or vitamins. Such elements occur, among other places, in the polishings of rice, cast off during the second stage of milling, when the pericarp of the grain is lost.

In 1883 the Surgeon General of the Japanese navy came to the conclusion that a monotonous rice diet was responsible for the high incidence of beriberi among the personnel under his care, of whom one-fourth were so affected. By reducing the rice issue and adding other foods he was able to eliminate the disease entirely and it has since been practically unknown in this group.

Rosenau quotes a convincing experiment conducted by Fraser and Stanton: "These investigators took 300 Japanese laborers into a virgin jungle, where they occupied new and sanitary quarters. After excluding the existence of beriberi by a careful examination of each person, they were divided into two parties of equal numbers. One party received polished rice as the staple article of diet, while the other party received undermilled rise with pericarp. In three months beriberi appeared among the members of the party receiving polished rice. When a certain number of cases had been noted, polished rice was discontinued and thereafter no cases occurred. No sign of the disease appeared among the party receiving undermilled rice." To make the experiment more conclusive, the two parties were reversed in respect of their diet and beriberi was again produced among those receiving fully milled rice. The disease has also been cured, when not too advanced, by feeding rice polishings or by adding other food substances containing the proper vitamin.

**Diagnosis.**—The symptoms of beriberi are quite similar in many ways to those of arsenic poisoning, especially in that form of beriberi known as the dry or paraplegic type. The second type is accompanied by a marked edema of the extremities, which may be the only, or the most prominent, symptom for quite a while. A third type is recognized, which is a combination of the other two. In nearly all cases there is involvement of the heart, which frequently prevents even the lightest of exercise. The disease tends to grow progressively worse and death may occur suddenly, at any stage, due to heart failure.

**Prevention.**—Since deficiency in certain food elements is the cause of beriberi, its prevention obviously lies in supplementing a too monotonous diet by such food substances as contain the missing ingredients. Milk, fresh meat, fresh or dried legumes, are all rich in the necessary vitamins and are almost equally effective in preventing the incidence of the disease.

A method that has been tried with some success is the imposition of an excessively high tax upon completely milled rice, which forces the use of the undermilled variety.

Final elimination of the disease rests upon persistent education in dietetics for the populations affected.

**Mortality.**—No definite statistics of beriberi mortality can be cited. At the Culion leper colony deaths were reduced more than 300 a year by proper feeding and the resultant disappearance of beriberi. The case fatality rate is said to range from 5 to 30 per cent.

## 3. CHICKENPOX

Chickenpox needs to be considered largely to differentiate it from smallpox. It has no mortality and is of extreme mildness. However, loss of time from school, especially in extensive outbreaks, is of sufficient importance to demand active control measures.

**Infective Agent.**—The infective agent is unknown, but is apparently carried in the secretions of the mouth and nose and in the exudate from lesions of the skin.

**Incubation Period.**—Incubation is usually limited to between 14 and 17 days, but may be as short as 10, or as long as 20 days.

**Immunity.**—In children the susceptibility is high, but it diminishes with advancing years. Adults are occasionally attacked, although much less frequently than would appear from reports of alleged cases of chickenpox in those over eighteen. Schamberg states that he saw 25 adult cases in the course of eight years of wide experience. A report of chickenpox in an adult should always arouse the suspicion of the health officer and lead to an investigation as to the vaccination history and symptoms.

**Modes of Transmission.**—The disease is disseminated, so far as we know, in the same manner as smallpox.

**Diagnosis.**—Differential diagnosis is stressed in the discussion of smallpox. A few points should be emphasized, however.

1. There is practically no prodromal stage.

2 The rash develops suddenly.

3. *Distribution of the rash is characteristic.*—It usually appears first upon the trunk, although sometimes developing primarily on the face. There is an even distribution on

the face and trunk, no particular areas being shunned, as in smallpox. It diminishes in amount as we pass downward along the extremities.

4. The rash passes through all stages in a few days.

5. Successive crops of lesions appear for about a week, so that any given area of skin will bear the rash in *all stages of development.*

6. The vesicle is easily ruptured with the finger.

7. True umbilication is not present, but a depression may be found in some vesicles, due to escape of fluid.

8. Subsequent pitting is rare.

9. Recent successful vaccination is good presumptive evidence against smallpox.

10. When in doubt as to diagnosis, always treat the disease as smallpox.

**Methods of Control.**—Isolation of the patient and concurrent disinfection should be practiced. The secretions of the mouth and nose, together with exudates from the lesions, should be destroyed, as in smallpox. Children exposed to a case of chickenpox should be excluded from school for a period of fourteen days. Again let us emphasize the necessity of investigating reported cases of the disease in adults. Careful control of chickenpox cases will eliminate the chance of smallpox gaining much headway in a community.

**Mortality.**—There is no mortality from the disease.

## 4. CHOLERA

In many of its epidemiological aspects cholera resembles typhoid fever quite closely: infection is taken in by the mouth; it is passed out with the dejecta; it is transmitted by water, and is acquired by receiving into the digestive canal fecal matter from some person who has a case or is a carrier of the disease.

Within the memory of the older generation in this country several nation-wide epidemics of cholera occurred. The disease is prevalent continuously in many parts of the far East and, to some extent, in the Pacific islands. Yet not a case has developed in the United States during the last 25 years. Such a record is a magnificent monument to the diligence of our maritime quarantine authorities who have discovered many cases at their various stations and have thereby prevented foci of infection from developing in this country. So accustomed have we become to look upon cholera as a relic of the past that we often overlook the fact that it is constantly on our doorstep.

Another fact that lends interest to this disease is that it was the first in which the carrier condition was recognized and demonstrated to be an important public health problem.

**Infective Agent.**—In 1883 Koch discovered a minute, curved bacillus that he could show was constantly found in the discharges of patients suffering with cholera. Repeated observations of others have confirmed this finding and it has been further established as the causal agent by accidental infection of laboratory workers with resultant production of the disease. The bacillus has been variously termed the Koch bacillus, cholera bacillus and *vibrio cholerae*. It is actively motile and non-spore forming. Drying and sunlight kill it quickly, but in water it can survive for several days, unless the water is highly polluted with other organisms that crowd it out. Milk also offers a good culture medium, for a short while, but the lactic acid bacilli, as they develop, destroy the cholera organisms. It has never been shown to grow in soil. As with the typhoid bacillus, we can say that the *vibrio cholerae* is primarily a human parasite.

**Incubation Period.**—Incubation does not extend, in the majority of cases, over three days and may be as short as one. Occasionally it has been known to be delayed for a week.

**Immunity.**—Immunity acquired by an attack of the disease is effective, but of short duration. Several methods of producing immunity by vaccination have been tried with varying success. The most promising of these employs four milligrams of an agar culture, killed at 58° C. In Japan this was first tried, using two milligrams of culture. Of those inoculated, 0.06% acquired the disease and 0.02% died, as compared with 0.13% of cases and 0.1% deaths in those not inoculated. After the dose of vaccine was doubled, not another case occurred among those inoculated.

**Modes of Transmission.**—Water has been the medium through which the great epidemics have been propagated. This was particularly well shown by Koch in 1892–93, during the epidemic at Hamburg, when he was able to recover the bacilli from the city water supply repeatedly. In strictly localized outbreaks the same mode of transmission often operates. Milk is occasionally responsible for a few cases, but is not of great significance. Vegetables fertilized with sewage, as is the custom in many countries, have been known to produce small outbreaks.

Contact is probably the chief mode of transmission, after water. It is believed that it plays a large part in the continued presence of the disease in India. Dirty hands and freshly soiled clothing are the immediate instruments of transference.

Undoubtedly flies are responsible for many cases, as is true of typhoid fever, by carrying cholera laden excreta on their feet and in their intestinal tracts.

Carriers of two classes have been recognized, active and passive, or convalescent and contact. Fortunately the organisms do not persist in the stools of either for as long a period as in the case of typhoid carriers. In fact, most of them lose their vibrios within two or three weeks. The interesting point to note in connection with cholera carriers is the fact that persons in contact with cases may develop the carrier state without showing any symptoms of disease. The carrier is important as a source of new outbreaks, or in keeping alive one that has already started.

**Diagnosis.**—Diagnosis is chiefly of academic interest in this country, at present, but, like plague, may assume a more practical aspect at any time, especially in our port cities.

Clinical symptoms of cholera may range all the way from a simple diarrhea to the most sudden and profound prostration, with fever, violent diarrhea and rapidly ensuing death. A distinction should be made between true cholera and the disease of infants known as cholera morbus, nostras or infantum. The latter is probably more akin to dysentery.

Laboratory diagnosis is comparatively certain and is always depended upon by the Immigration Inspectors for the detection of cases or carriers. Its successful application is witnessed by their record, already referred to.

**Methods of Control.**—Control of the patient includes concurrent disinfection of his stools, urine and articles that have been in contact with him. The attendants must exercise scrupulous cleanliness of the hands.

In water borne outbreaks the supply must be chlorinated until all pollution has been removed. Sewage should be treated in order to place as little burden as possible upon the water purification apparatus.

Excreta disposal must be safeguarded by the usual means, including the screening of privies and the prohibition of promiscuous scattering of feces upon the ground.

Carriers must be sought for in all outbreaks, especial attention being given to those who have been in contact with cases. At times it is necessary to establish emergency laboratories and to carry on extensive surveys of the population for this purpose.

Border quarantine is an exceedingly important feature of cholera control. By its unceasing vigilance and strict enforcement alone can a country be kept free of the disease, for little has been done among the more backward nations to control its spread. In addition to these measures, our government maintains inspectors at the southern European ports of departure, for the purpose of detaining suspects and of notifying this government of disease prevalence.

**Mortality.**—Sixty per cent., or more, of cholera cases prove fatal. It is the cause of thousands of deaths in India every year. During the great war the disease spread into the Balkan states and even reached portions of western Europe, causing much destruction of life. Our own nation has paid its toll to the disease in times past and is free today only through the untiring watchfulness of our outposts.

## 5. ACUTE CONTAGIOUS CONJUNCTIVITIS

Under this heading fall a number of communicable eye infections aside from trachoma. The most important of these are gonorrheal ophthalmia and the condition commonly known as "pink eye." This latter infection, however, is entirely overshadowed by the former which is responsible for more conjunctivitis and resulting blindness than any other single eye disease. "Pink eye" rarely produces any permanent effects. Its exciting organism is the Koch-Weeks bacillus and it is extremely contagious, being spread in the same manner as trachoma. Control of an outbreak is secured by preventing the transference of eye secretions.

The following discussion will deal entirely with the gonorrheal form of ophthalmia.

**Infective Agent.**—The gonococcus is the exciting cause, sometimes accompanied by other pyogenic bacteria.

**Incubation Period.**—Only two or three days elapse, after infection, until symptoms make their appearance.

**Immunity.**—So far as we know, all persons are susceptible to the infection, new-born infants in particular.

**Modes of Infection.**—In the case of infants, the majority acquire infection during birth, from the infected genital tract of the mother. They may also be infected, subsequent to birth, by the contaminated fingers of the mother or nurse.

A person suffering with an ordinary gonorrheal urethritis may transfer infection to his own eyes, or to those of another, by means of his contaminated fingers, or by a common towel.

**Diagnosis.**—Microscopic examination of the pus from an inflamed eye reveals the characteristic intracellular diplococcus, which is negative to Gram's stain.

In the absence of microscopic evidence, an eye presenting the following symptoms, together with a history of likelihood of a gonorrheal infection being present in patient or associates, would warrant a clinical diagnosis of gonorrheal ophthalmia; intense redness, profuse discharge of pus, extreme photophobia, tenderness and swelling of the eyelids and adjacent parts.

**Methods of Control.**—All that is said under "Trachoma," as to preventing the transference of eye discharges, applies with particular force to this disease. In the case of the new born, infection can be practically eliminated by the simple procedure of dropping a one or two per cent. solution of silver nitrate into the eyes, immediately after birth. Many states make this compulsory for all births, but the vast amount of blindness still prevalent, from this cause alone, indicates the urgent need of universal regulation, together with education of the public. The question is further bound up with the entire subject of venereal disease control, which will be discussed in a separate chapter.

**Mortality.**—There is no mortality from the disease, but the ensuing blindness is often worse than death itself. At least one-fourth of all blind in the world are the victims of gonorrheal infection, usually acquired from the mother at birth.

## 6. DENGUE

While dengue is principally a disease of tropical and subtropical climates, it has been found as far north as Charleston and is frequently encountered in Texas. It tends to appear in extensive epidemics that spread rapidly and affect a greater portion of the population than even influenza. The disease has been popularly called "break bone fever" or "dandy fever," due to the pain and stiffened gait of the sufferer.

**Infective Agent.**—The specific cause of dengue has not been discovered, but it has been demonstrated to be a filterable virus, present in the blood plasma of patients and inoculable into healthy persons by injecting the blood of those suffering with the infection.

**Incubation Period.**—Incubation of experimental cases covers from 3 to 14 days. The average, so far as it can be determined for naturally acquired cases, is given as 1 to 3 days.

**Immunity.**—There appears to be no natural immunity to dengue, but protection may be acquired by an attack of the disease and will persist for at least a year.

**Modes of Transmission.**—It seems to be fairly well established that the infection is transferred by the mosquito *Culex fatigans*. One author in Australia also implicates *Aedes calopus*. At least, we know that the affection is not contagious in the ordinary sense.

**Diagnosis.**—Manson gives the following summary of cardinal symptoms: ". . . the essential symptoms in well marked cases are the same practically everywhere, and in all epidemics; these are, suddenness of the rise of temperature, an initial stage of skin congestion, limb and joint pains, and a terminal rubeoloid eruption."

The attack is usually ushered in without warning by a rapidly rising temperature and the development of excruciating pains in the head, joints and muscles. Exhaustion is extreme, due to pain and high temperature. After three days, these symptoms may entirely disappear and the patient be able to go about his business. However, after three or four days, a second attack supervenes and the early history is repeated. At this time the rash develops, but is not characteristic in its form. Symptoms gradually subside, but traces may be left for a long time. Ordinarily the entire attack covers a period of about ten days. Nervous depression may persist for months, after all acute symptoms have passed.

The principal features mentioned above, coupled with a widespread epidemic of the same character, would serve to differentiate the disease from any other.

**Methods of Control.**—Measures to control dengue should be directed against the mosquito, *culex fatigans*, which is quite ubiquitous and is given to biting at almost any time of day. Practically the same methods should be used as are applicable to eradication of the malaria mosquito.

Screening will protect the well and also prevent mosquitoes from reaching the sick. No measures, other than screening, are required in controlling the patient. Mosquitoes in the sick room should be destroyed.

**Mortality.**—Only rarely does a person suffering with dengue succumb, so we may say that the mortality is nil.

The disease is important because of the rapidity of its spread and the prostration of a large portion of the population at one time.

## 7. DIPHTHERIA

From the time of Homer to the present, diphtheria has held a leading place among all causes of death and first rank among the acute, infectious diseases. Unlike many of the others, it kills, not so much by its complications, but by itself, through the generalized toxemia produced. Prior to the discovery of antitoxin, by Behring, the percentage of deaths amounted to about 75, but the case fatality rate has been reversed, since antitoxin came into widespread use, and even more can be expected following the introduction of adequate public health administration, with its modern methods of control and better provisions for early treatment.

**Infective Agent.**—Klebs first suggested that a peculiar bacillus might be responsible for the manifestations of diphtheria and, a year later, Loeffler satisfactorily demonstrated that this organism was really the infective agent. It now bears the name *Bacillus diphtheriae*, or Klebs-Loeffler bacillus. For a detailed description of the organism, the reader is referred to recent works upon bacteriology. It should be noted here that the habitat of the bacillus, when found within the human body, is principally in the tonsilar crypts and in the protected structures of the nose.

**Incubation Period.**—Incubation is quite brief, lasting not over seven days, as a rule, and usually terminating in two. It is sometimes difficult to determine with exactness, for the reason that a person may harbor the bacillus in his throat for a considerable time without presenting any symptoms of disease.

**Immunity.**—Natural antitoxic immunity appears to exist, to some extent, and to be quite variable, dependent upon certain factors which we do not understand as yet. Children from the age of six months to ten years are most susceptible. Recent work tends to show that crowding, with resultant repeated exposures, confers greater immunity than that found among children who are not allowed to run the streets. In most cases an attack of the disease will confer an active immunity varying from months to years. This can also be produced by injections of a toxin-antitoxin mixture.

The latter has been giving such satisfactory results in the hands of Park and others that it may be recommended as a routine. Observations by the authors, extending over a period of two years, have indicated that the preparation is safe and satisfactory, when produced by reliable laboratories. Park has been able to demonstrate circulating antitoxin in the blood of children immunized six years ago. The usual procedure in applying toxin-antitoxin is, first, to eliminate all immune persons by means of a Schick test survey and, then, to control the results of immunization by further Schick tests on those formerly susceptible. At least 85% of these latter can be immunized by three 1 c.c. doses of the mixture, given at about weekly intervals. A rather long period of time is required to develop the full immunizing effect, extending at times to three months from the last dose. A prophylactic dose of antitoxin, given just prior to, or during, the administration of toxin-antitoxin, will diminish the effect of the latter to some extent. This can be overcome by increasing the number of doses.

Passive immunity is produced by the use of horse blood-serum from actively immunized animals. Such a preparation is an "antitoxin" and its nature should be well understood in order to appreciate its proper uses and limitations. There is introduced into the circulation of the horse a definite amount of toxine,[1] to which most of the symptoms are due. This toxine is a mixture of complex chemical compounds and may be found in many parts of the body not invaded by the bacillus at all. Its effect is promptly to arouse certain forces of the body which compound corresponding substances that neutralize the toxine. These substances are the "antitoxin" which we apply for prophylactic and therapeutic purposes. A given quantity of it will destroy a like amount of toxine and the two can be measured with remarkable exactness, so that we are able to provide various doses of antitoxin containing "units" in definite quantities. From a given number of units we can expect a certain amount of protective or curative effect, and no more. One point that should be understood is that the antitoxin *has no effect upon the bacillus* itself; it simply neutralizes the toxine produced by the bacillus. Another interesting feature of antitoxin from the horse is that the human body eliminates most of it in two or three days and all of it in two to three weeks. Also, the higher the number of units introduced, the longer will be the period of effective immunity. This is one of the strongest arguments for large doses, given early, in treating a case of diphtheria.

The Schick Test is a valuable method of determining the presence of natural or acquired immunity to diphtheria. The test is performed by injecting between the skin layers $1/10$ of one cubic centimeter of a standard dilution of diphtheria toxin. If no immunity is present, a distinct red areola appears in about 24 hours at the point of inoculation;

[1] Note that the word "toxine" is used, as suggested by Rosenau, to mean the entire filtrate from a culture of *B. diphtheriae* and contains toxin, toxon and other substances.

this turns to a brownish area, which gradually fades. If immunity is present, no reaction appears. There is, however, an occasional pseudo-reaction which may cause some difficulty in differentiation. Directions for applying the Schick Test will be found in the appendix.

**Modes of Transmission.**—Droplet infection and ordinary contact are principally responsible for the spread of the disease. The bacteria have been demonstrated upon articles recently soiled with the saliva of patients and carriers, so that these objects may also contribute to its dissemination. It can readily be seen that a carrier or patient could also impart the infection to susceptible children by kissing.

In diphtheria the carrier problem is one of tremendous importance. Careful studies conducted in various parts of the world indicate that carriers form about *one per cent* of the entire population.

This is probably the explanation for those sudden and otherwise unexplained epidemics that appear in various communities with great frequency, and is also the reason for persistent recurrences of cases in a neighborhood. Carriers are divided into two classes, active and passive. The former are those who are convalescing from an attack of the disease, while the latter are those who have been in contact with a patient, or with another carrier, but have exhibited no symptoms of infection. In about half of the cases of active disease all bacilli disappear from the nose and throat in two weeks. Among the remainder the time varies widely and the condition occasionally becomes chronic. In one reported case the carrier retained virulent organisms after eight years of observation. The passive carrier sometimes falls victim to his own germs, developing an active case after having harbored the bacilli without symptoms, perhaps for months. Several cases of this sort have come under our personal observation.

**Diagnosis.**—With laboratory facilities available, diagnosis of a case should rest entirely upon the bacteriological findings. The procedure is so simple and the results so certain, that this safeguard to the patient should never be ignored in any suspicious throat lesion. Lacking such opportunity for positive diagnosis, the disease must be differentiated from septic sore throat, and, sometimes, from scarlet fever. Occasionally other conditions present a pseudomembrane, but the two mentioned are the ones in which it is commonly encountered. Tonsilitis should offer no difficulties to anyone who has seen the diphtheritic membrane. In distinguishing the other two diseases named from diphtheria, the outstanding feature of the latter affection is that the patient is not so sick, at first, as he usually is with either of the other infections. They both present sudden and profound prostration whenever their severity is sufficient to give rise to a pronounced membrane formation. It frequently surprises the practitioner to find a child up and playing about, with a well developed diphtheritic membrane in its throat and a moderate fever.

When in doubt, play safe and treat it as diphtheria. No harm is done and a life may be saved that would otherwise be sacrificed.

Diagnosis of a carrier condition rests entirely with the laboratory. No reliance whatever should be placed upon the appearance of the throat, for a very large proportion of such persons *show no evidence whatever of any inflammatory process* in either throat or nose. This is particularly true of temporary carriers; while some who develop a chronic condition of this sort may have inflamed tonsils, an atrophic rhinitis, or a discharging sinus. In dealing with carriers it is important to determine whether the organisms present are virulent, or not. Many virulent types are encountered that can be distinguished from the dangerous forms only by animal innoculation. When the carrier condition persists, it is necessary to have a virulence test made in order to determine whether the carrier should be kept under continued surveillance.

It is quite important to observe correct technique in taking cultures. Two perfectly sterile swabs must be used, one for the nose and the other for the throat, in order to determine the exact location of the bacteria. The throat swab is passed back to the tonsils, without touching the tongue, in order to avoid contamination with mouth bacteria, and is pressed deeply into the membrane, or into the crypts of the tonsil, if no membrane is present. It should be slightly rotated in order to gather as much infective material as possible. The nose swab is gently inserted well into the posterior nares and rotated. Both swabs are replaced in their respective sterile containers, without being allowed to come into contact with anything else whatever. Each container should be marked so that cultures from the two locations may be distinguished. If culture medium is used, the swabs are gently rubbed upon the surface of the medium and then destroyed by burning. The customs of state and city laboratories vary, some supplying only the sterile swabs, while others furnish culture medium.

It should be borne in mind that, in the case of carriers, only a comparatively few bacilli are present, as a rule, upon the surface of the mucuous membrane, except after recent contact with a case. Consequently, a single examination may not reveal them at all. If, however, a person has once been found to harbor the organisms, he should not be regarded as free of them until repeated swabbings of the deep tonsilar crypts and the recesses of the nose show no diphtheria bacilli present at any time. Many health departments require three successive negative cultures, taken 24 hours apart, before releasing a carrier or a case.

**Methods of Control.**—The subject of control is broadly divided into the control of the case and the control of the carrier.

The patient sick with diphtheria must be isolated and all discharges from his nose and throat destroyed. Articles soiled with these discharges must be thoroughly disinfected, if they cannot be burned. Particular attention should be paid to cases of diphtheria in connection with dairies, to see that the nurse has no contact whatever with the handling of milk intended for public distribution. When clinical symptoms have subsided, but bacteria are still present in the throat, the patient becomes an active carrier and will be considered under that head.

Such a mass of detailed information has accumulated with reference to the management of the carrier that only an outline of the essential points can be attempted here. Simon's Human Infection Carriers gives a concise discussion of our latest knowledge on this subject and is worthy of close study. As was said a moment ago, the patient becomes an active carrier when free of symptoms. From that time on, his condition can be determined only by cultural tests. It should be noted here that the *attending physician's function is completed,* when his patient is clinically cured, and that from that point on the management of the person who has been ill is the *health officer's* responsibility as a guardian of the public health. This is a distinction that is seldom made and thereby breeds much discord between physician and health officer, or else, tends to slakening of public health control. The attending physician has no further rights in the case whatever, when it becomes solely a question of controlling the individual for the good of the *public* and not for his own good. The health officer, then, must determine the length of isolation, and his sole means of reaching a decision is the laboratory report. No person who has had an attack of diphtheria should be released until three successive negative cultures have been secured. These cultures should be taken not less than twenty-four hours apart and it is important to know that the subject has not used any antiseptic in the throat for at least twelve hours prior to swabbing. When one encounters a persistent carrier, it eventually becomes necessary to arrange for his release; but this should be provisional and under the constant supervision of the health officer. It must be borne in mind that not all diphtheria bacilli found in the naso-pharynx are virulent. Therefore, the health officer should have virulence tests made in the case of persistent carriers, in order to relieve those who are inocuous from further supervision.

Those persons who have been in immediate contact with the patient are the next important concern, for, after the patient, they are potentially the most dangerous. The health officer should take cultures from all such, immediately upon discovery of a case, isolating those found to be carriers, *just as he would isolate a patient* sick with the disease. Such carriers should be given a prophylactic dose of antitoxin, for a certain number of them will develop symptoms, if unprotected. All contacts who do not show bacilli should likewise be immunized, or, refusing that, quarantined for five days. A showing of positive immunity by the Schick test would at once release a person from the quarantine mentioned, provided that he harbored no virulent bacilli. Application of the test also conserves antitoxin by pointing out those who carry their own natural supply.

The secondary passive carrier, who has had no contact with an active case or active carrier, so far as ordinary investigations will show, offers a problem of some difficulty to the health officer. For, while we know that he is present to a certain extent, he cannot be singled out by any method except cultural examination of large groups. However, when diphtheria becomes prevalent among school children, or any other closely associated body of persons, no alternative is left but to examine every throat and nose culturally. Carriers discovered are managed as described above. In such a survey, one of the authors found 50 carriers in a school of 500, during a small outbreak of diphtheria. Some of these carriers later developed the disease.

Treatment of the carrier, in order to rid him of his "fatal gift," frequently falls to the lot of the health officer, or comes under his supervision. The list of remedies used for this purpose resembles a small abstract of the pharmacopeia, testifying thereby to their general failure to produce the desired result. From what was said earlier, it is apparent that antitoxin is not of any avail in clearing up passive carriers, even when applied directly to the throat and nose. However, encouragement is derived from the fact that the majority of carriers gradually throw off the organisms without aid, in the course of a few weeks. There remain, then, a small class that must be somehow dealt with. For them surgery offers the quickest means of cure. Since the bacilli lie hidden in the crypts of the tonsils and in the deeper structures of the nose, these are the obvious points of attack. It will be found that most persistent carriers have enlarged, and sometimes diseased, tonsils. Their removal produces a cure quite often and usually within thirty days following operation. Removal of nasal obstructions, including adenoids, also has a favorable effect in some cases. One chronic carrier coming under our observation was a boy who had a small cork lodged in his nose, and which had been there probably for years. Four days after the cork was removed, the bacilli disappeared, although he had been a carrier for four weeks at least. Finally, we reach an irreducible minimum which cannot be freed of virulent bacilli. These unfortunate persons must be held in isolation long enough to impress upon them the danger to others from their condition, and allowed to go only under the constant surveillance of the health officer. If an outbreak can be traced to one of them, he is thereby convicted of criminal negligence and must again be isolated.

The practice has grown up in a few places of making Schick test surveys of large groups of children and immunizing the susceptibles with a toxin-antitoxin mixture. Where reliable preparations of toxin for these tests are available this offers the most satisfactory method of protecting this most susceptible portion of the population. However the practice is growing of giving toxin-antitoxin without Schick testing, where it is not practicable to make the test. In view of the volume of evidence in support of this prophylactic, such procedure is amply justified and has a pronounced effect in reducing the diphtheria rate, where it is extensively employed.

In the face of a scattering outbreak of diphtheria, the health officer should make a cultural examination of all persons connected with the handling and sale of milk, if suspicion attaches to this product as a possible medium of transmission. If evidence points strongly to a milk supply and no carriers can be found at once, pasteurization should be immediately demanded as a temporary measure until further search for a carrier can be made.

**Mortality.**—In 1917 the death rate for diphtheria in the Registration Area of the United States was 16.5 per 100,000. Since then it has not materially decreased. And yet, only a fraction of one per cent. of cases die, if treated *promptly* with antitoxin. The appalling mortality has three explanations: failure on the part of the physician to diagnose properly; failure to administer antitoxin either sufficiently early or in large enough quantity, and failure of the public to appreciate the necessity of calling a physician in every case of sore throat. With a suspicious membrane in the throat, valuable time should not be lost by waiting for a report upon a culture, if it cannot be had within twelve to twenty-four hours, depending upon the severity of the case. IT IS AXIOMATIC THAT EARLY ADMINISTRATION OF A LARGE DOSE OF ANTITOXIN WILL SAVE PRACTICALLY EVERY CASE OF DIPHTHERIA. By "early administration" is meant within the first twenty-four hours. By a "large dose" is meant 10,000, or more, units. Except in the youngest infants, the physician should not fail to give a dose of this size *at once*. Given then, it will do infinitely more good than if divided into two or more smaller doses administered over a period of a day or two. IT MAY MEAN THE DIFFERENCE BETWEEN LIFE AND DEATH FOR THE PATIENT. In extreme cases, give the antitoxin intravenously, after one cubic centimeter has been injected subcutaneously to test the individual's sensitiveness. We cannot expect a further fall in the death rate for diphtheria, until physicians universally adopt these practices, together with the active immunization of all who will accept it.

## 8. DYSENTERY

The term dysentery can no longer be considered as having specific significance, but is rather a group designation for a number of infections presenting identical symptoms. Two large divisions, or types, are recognized, bacillary and amoebic, but even these cannot be distinguished clinically.

Both diseases are, however, infectious, appearing in extensive epidemics at times, so that they may assume considerable sanitary importance. Dysentery formerly was a plague to armies more disabling than the enemy's fire. Extensive outbreaks of this sort have disappeared, but circumscribed groups of cases were frequently seen even in the late war.

**Infective Agent.**—In the *bacillary* group are found several well defined strains of bacilli, each producing typical dysentery. The more common of these are the Shiga and Flexner varieties. Besides, there are some bacilli that are found only occasionally, while in other cases of clinical dysentery organisms have been found predominating in the stools that could not be indisputably connected with the disease as causal agent. It is not necessary to go further into the bacteriology of the group for the purposes of this discussion.

*Amoebic* dysentery is produced by a protozoan unicellular organism known as *entamoeba histolytica,* and occasionally by *lamblia intestinalis.*

**Incubation Periods.**—It is impossible to give definite incubation periods, but the time is thought to be quite short.

**Immunity.**—So far as known no natural immunity exists to any of these types of infection. Antisera for the bacillary type have given quite promising results when used therapeutically. There is nothing of the sort, however, for the amoebic form. In the latter condition ipecac would probably maintain a certain degree of immunity as long as administered.

**Modes of Transmission.**—In the United States the usual vector of bacillary dysentery is probably the fly, while extensive outbreaks are occasionally seen as the result of water pollution. However, dysentery is commonly the result of unprotected human filth, lying on the open ground or in unscreened privies, exposed to the approach of the ubiquitous fly. Connection must be quite direct between the excreta of patient or carrier and the mouth of another person.

Amoebic dysentery is not indigenous to this climate, but is usually an importation from the tropics. It is occasionally found in endemic foci in the southern part of the United States. The infective form of the amoeba is the cyst, which is carried by water and may also be blown about in dust contaminated with it.

**Diagnosis.**—There are two outstanding clinical features of dysentery, severe diarrhea and mucus in the stools. The bacillary type also produces considerable toxemia, in the majority of cases, while the amoebic type is more chronic and lacking in the latter feature. It does, however, tend to the formation of hepatic abscesses. Amoebic dysentery can often be differentiated from the bacillary type by the administration of ipecac. This drug is specific for amoebae, but has no effect on the bacilli.

Laboratory examination of a patient's stools will usually reveal the diagnosis, if done by a competent bacteriologist. Identification of the dysentery bacillus, however, is tedious and recognition of the *entamoeba histolytica* requires acquaintance with all forms of amoebae that may be found in the intestines.

**Methods of Control.**—The principal control measure for dysentery is that directed at the proper management of the patient. Concurrent disinfection of the stools and of all articles soiled with them, screening against flies, and care of the attendant's hands, are essential.

Water borne outbreaks are controlled by chlorination of the water supply and proper safeguarding of its source.

Convalescents must be watched to insure safe excreta disposal, until the stools have returned to normal. This demands that privies, if used by such persons, shall be absolutely fly-tight and the contents disposed of in a sanitary manner, by either burying, burning or dumping into a sewer that is properly supervised.

The health officer should receive reports of all dysentery cases and see that these measures are strictly applied. He should be especially careful that a convalescent is not engaged in the handling of food for public consumption.

**Mortality.**—Some forms of bacillary dysentery are fatal in as high as 35% of cases. Other forms do not produce such great mortality.

Untreated amoebic dysentery has about 25% mortality, but the early use of ipecac reduces this to practically nothing. In the southern United States it would be well to suspect this type of infection in all cases of the disease and to administer some form of the drug upon the first appearance of symptoms, unless profound toxemia is present. Two or three days will suffice to produce some improvement, if amoebae are the infective agent. While this plan is not ideal, it may save many cases that would otherwise result in chronic invalidism or death. Since the stools must be examined in a fresh state, if amoebae are to be detected, it is impossible to send specimens to a distant laboratory for examination.

## 9. FAVUS

Favus is a parasitic skin disease which sometimes gains a foothold in a school and is rather resistent to treatment. It attacks the scalp in practically all cases.

**Infective Agent.**—The specific agent producing the disease is a vegetable fungus, the *Achorion schönleinii*, which grows in the hair, the hair follicle and in the epidermis surrounding the latter. The fungus throws out fine, hairlike branches which form a thick, bright yellow mat about the root of the hair.

**Incubation Period.**—The incubation period is unknown.

**Immunity.**—While Russians, Poles and Italians of the poorest class most commonly present the disease in this country, it is often seen in native Americans.

**Modes of Transmission.**—Crowding and lack of hygiene favor the spread of favus. Wearing a hat of an infected individual, or sleeping in the same bed with him, or using a brush and comb that he has used, are the commonest means of spreading the disease. Domestic animals are said to suffer with the infection and to be capable of transmitting it to human beings.

**Diagnosis.**—About the affected hairs are sulphur-yellow crusts, that have a cup-shaped appearance which is regarded as characteristic. This crust is formed by masses of fungus growth and is quite dry and friable. The hairs gradually fall out, in the regions of infection, leaving irregular bald patches.

Ring-worm of the scalp is to be distinguished from favus by its more rapid course and the tendency to form well defined round areas, with the hairs broken off in such a manner as to give a "gnawed off" appearance. The color of the ring-worm lesion is more of a reddish brown. The microscope will distinguish favus from purulent infections which may resemble it.

**Methods of Control.**—Personal cleanliness will usually protect against infection.

A child with the disease should be excluded from school until cured. Cloak rooms in school buildings should be provided with hooks sufficient for all pupils and each one should be compelled to use the hook assigned, at all times. Exchange of hats should be discouraged. Free clinics for the treatment of such cases are needed, for the same reasons mentioned under impetigo and trachoma.

**Mortality.**—There is no mortality from favus.

## 10. FILARIASIS

There are at least half a dozen filariae that are parasitic in the human body. Only one is of any particular significance, however, and the discussion will be confined to it, viz., *filaria bancrofti.*

These forms are found chiefly in the tropics, but occasionally in other latitudes, even in the United States. Such cases, however, are usually imported from the tropics.

**Infective Agent.**—The filaria is a nematode that is parasitic in man and mosquitoes. Adult forms are not found in the blood, but in the deep lymphatic vessels, where they lie in pairs and reproduce at frequent intervals. The female is a slender thread, about 80 mm. long, while the male is even more slender and only about half the length.

The larvae are slender, transparent worms, about 0.3 mm. in length. They are actively motile and are enclosed in a delicate membrane, within which they constantly move about. A striking feature of this particular species of parasite is that it makes its appearance in the peripheral circulation only when the human host is asleep. It is present in greatest numbers about midnight and has disappeared by morning. This periodicity is quite regular. The larvae may be present in enormous numbers in the circulation without causing any apparent symptoms. Manson has demonstrated that they retire to the larger and deeper vessels during their absence from the peripheral blood stream.

**Incubation Period.**—The period required for a pair of larvae, introduced into the body, to reach sexual maturity and produce new generations, is unknown.

**Immunity.**—No natural immunity to the parasite has been demonstrated.

**Modes of Transmission.**—Mosquitoes are the vectors of the worm. When a mosquito bites a person whose blood is infested with the parasites, a few of the larvae are taken into the insect's stomach with the aspirated blood. Here the delicate enveloping membrane of the larva is shed and the worm emerges as an actively motile organism. It penetrates the stomach wall and works its way among the muscle fibres to the mosquito's head, where it travels down the proboscis, always with a mate, to lie in wait for an opportune time to enter a new human host. This is accomplished by piercing the outer covering of the proboscis at the time that the mosquito bites.

Some observers believe that the parasite may leave the mosquito's body at the time she lays her eggs and can then be acquired by persons drinking such infested water. No proof of this has been offered, however.

**Diagnosis.**—Diagnosis is made by microscopic examination of a fresh drop of blood, taken at night, or by stained smears.

**Methods of Control.**—Control of the mosquito and screening of infested individuals are the methods of preventing parasite transference.

**Mortality.**—Death from filariasis results only occasionally, due to inflammation set up by the parasite in the lymphatics.

It is believed, however, that the condition known as tropical elephantiasis is a direct result of lymphatic obstruction caused by the filaria. This disease is disfiguring and distressing in the extreme and may cause death through inflammation or gangrene of the affected parts.

## 11. GERMAN MEASLES

German measles is of significance to the health officer principally as an affection to be distinguished from other diseases. Its mortality is practically nil and it has no important sequelae.

**Infective Agent.**—Nothing is known of the organism producing it, but some form of living organism is assumed from its general conformity to other conditions caused by microörganisms.

**Incubation Period.**—The incubation period is quite variable, according to many observers, ranging from five to twenty days, with an average of fourteen. Further investigations may show these limits to be excessive.

**Immunity.**—So far as known, all persons are susceptible. One attack appears to confer immunity for life.

**Modes of Transmission.**—Droplet infection is probably the principal means of transference, but this has not been demonstrated, as yet. The hands and articles soiled with the fresh secretions may contribute to its spread.

**Diagnosis.**—For many years, German measles was regarded as a hybrid measles, or hybrid scarlet fever, for it partakes somewhat of the symptoms of both diseases. It is to be distinguished from measles by the usual lack of any prodromal symptoms, by lower temperature, by the absence of Koplik's spots in the mouth and mild or absent catarrhal symptoms, as well as by the character of the eruption. The rash is commonly the first symptom noticed. From scarlet fever it may be differentiated by the early subsidence of the rash and by the absence of both the "strawberry tounge" and severe tonsilar involvement. The throat, however, presents more inflamation than in measles. A sign of considerable dependability is the enlargement of the occipital lymphatic glands, which often assume great size. The eruption is of a rose tint, lacking the brightness of scarlet fever and the somewhat bluish cast of measles. However, the diagnosis of an isolated case is often exceedingly difficult, in the early stages. It is wise to make a guarded diagnosis and to establish tentative isolation.

**Methods of Control.**—Exclusion of the patient, for seven days, from school, from public gatherings and from contact with non-immunes, is sufficient, together with concurrent disinfection of nose and throat discharges.

Non-immune contacts should be held in modified quarantine of the same character, for twenty one days, if at all.

School children, exposed to a case, should be inspected daily for suspicious symptoms, until the incubation period is passed. This inspection need not start until the fifth day after the first exposure.

**Mortality.**—The mortality of German measles is negligible.

## 12. HOOKWORM DISEASE

After malaria, hookworm infestation has been the most prolific cause of disability and economic deterioration in our Southern States. Many counties have shown an incidence as high as 90% of the population. The parasite has been found in various parts of the world, and is frequently the cause of defective development and marked inefficiency throughout large areas of the tropics.

**Infective Agent.**—Many varieties of hookworm have been described, each being parasitic for only one or two animal hosts. Man is favored by two species, the Old World hookworm, *Ankylostoma duodenale,* and the American variety, *Necator americanus.*

Only the adult worm is parasitic in man. It fastens itself to the intestinal mucosa by means of a hooklet and sucker. The membrane is pierced and blood withdrawn by the worm, a part being ingested as food and the rest wasted. The female continuously discharges eggs, which are thrown off with each bowel movement of the host and commence their life cycle, if conditions are favorable. Warmth and moisture are essential to hatching, hence the worm flourishes more abundantly in warm, humid climates. Dryness and freezing are fatal to the larvae within 24 hours.

A day is required for the larva to hatch from the egg. In a few days it sheds its skin, and again a few days later. The second moult is not thrown off, but forms a protective coat. In this state the larva has slight motility and is able to penetrate the skin.

**Incubation Period.**—Experiment has shown that from 7 to 10 weeks elapse from the entry of the larva through the skin until eggs are to be found in the stools of the host.

**Immunity.**—No immunity to hookworm infection is known to exist.

**Modes of Transmission.**—In a very small percentage of cases infestation may be acquired from water, vegetables, or by mouth from hands that are contaminated with the larvae. The latter can survive in water of proper temperature for about a month.

The great bulk of infestation is received from polluted soil. In this medium the encysted larva can continue its existence for several months. The common point of entry for the larva is through the skin of the feet, especially between the toes. As it penetrates the skin an irritation is set up which is widely known as "ground itch." It may also enter through the skin of the hands or arms, in case polluted soil is handled.

Once having invaded the deeper tissues, the larva travels by way of the lymphatics to the vena cava, and finds lodgement in the pulmonary capillaries. Thence it breaks through into the alveolar spaces and is coughed up, passing with the mucus into the intestines. During its passage it increases in size, until it is of practically adult dimensions by the time its final habitat is reached.

**Diagnosis.**—In many persons there are few, if any, clinical manifestations of hookworm infestation. Usually, however, there are signs of anemia, malnutrition, mental retardation, or intestinal involvement of some kind. The blood presents a picture of secondary anemia and the differential count shows a slight increase of eosinophiles. Our main reliance is upon the stool examination, which will show the eggs in varying numbers. Under the low power of the microscope these have the appearance of large brown ovals, with a clear outer shell equal in thickness to about one-eighth of the short diameter, and with what resemble nuclei grouped in the center, numbering from four to sixteen. A further aid to diagnosis is the appearance in the stools of adult worms, from one-half to three-quarters of an inch long, after administration of a dose of thymol, followed by Epsom salts.

**Methods of Control.**—Knowing as we do the complete life history of the parasite, its eradication appears to be simple. But we are hampered by public indifference and ignorance (just as in malaria) which is particularly marked among the very classes which suffer most heavily from hookworm disease.

Sanitary privies, or complete sewerage, used by the entire population at all times, would almost entirely prevent the transmission of hookworms. Universal wearing of shoes would largely prevent the entrance of the larvae into the body. But the method of control which has been found to be most practicable and effective, by those who have had the widest experience, is to make these measures secondary to treatment of the human host to rid him entirely of parasites. Feces control without treatment will not eradicate the disease; treatment without feces control will not prevent re-infestation.

This procedure has had an educational influence upon the affected populations which has tended to maintain the preventive measures which have been established. But such a campaign must be thorough and planned to cover a period of years, until the entire population can be examined and treated. Once they have been freed of their parasites, there is such a marked improvement in physical activity and intelligence that there is less tendency to revert to former careless and insanitary ways.

**Mortality.**—Few persons die directly of hookworm disease. Its accompanying anemia, however, lowers vitality and opens the way for other infections and diseases.

Hookworm disease has an economic importance that ranks it practically with malaria in countries that are heavily infested. This fact has been recognized by governmental agencies in many parts of the world, and has resulted in the initiation of eradicative measures of great magnitude. Notable also is the work of the International Health Board of the Rockefeller Foundation, which has operated in our southern states for several years, and is extending its activities to many tropical and subtropical lands.

## 13. IMPETIGO

Impetigo contagiosa is an inflammatory skin disease that is frequently seen among children of school age and less commonly in adults.

**Infective Agent.**—No agreement has been reached as to the specific organism responsible. Streptococci in pure culture have been recovered from the lesions in some cases, while staphylococci have been found associated in others. The disease can be reproduced from the exudate.

**Incubation Period.**—The time required for incubation is unknown.

**Immunity.**—Well-nourished persons of cleanly habits are less prone to acquire the disease than others.

**Modes of Transmission.**—Contaminated fingers and common towels are probably the two commonest vehicles of transference. A patient often re-infects himself by scratching. Crowded, insanitary living conditions favor the transfer of infections such as this, due to lack of personal cleanliness and the common use, by a number of persons, of such articles as towels, wash basins, brushes, etc. Schamberg mentions twenty cases of impetigo, coming under his own observation, which all appeared to have been contracted in two days at a barber shop. All of these patients had the services of the same barber.

**Diagnosis.**—In impetigo there are initial vesicles which are small, flat and very thin walled, without any reddened areola, such as is seen in chickenpox. They prefer the exposed surfaces of the body, especially about the mouth. When a scab has formed it is flat and tends to curl at the edges, giving an appearance of having been "stuck on." The disease is often continued by the patient himself infecting other parts of the skin.

**Methods of Control.**—Perhaps the quickest means of controlling the infection is by curing all cases that are found. This is easily accomplished in two or three weeks by proper treatment. Here again the need of a free clinic is emphasized, for the disease is most common among those who are unable to pay medical fees. Children suffering from the disease should be excluded from school until cured, unless under adequate, continuous treatment.

**Mortality.**—Occasionally, an outbreak of impetigo in an institution for infants becomes quite virulent and causes some deaths. Otherwise there is no mortality.

## 14. INFLUENZA

From remote times and through succeeding centuries to the present day, the world has repeatedly suffered great epidemics of influenza. Sweeping periodically from east to west, these pandemics have cost millions of lives and for the civilized world today the disease continues to be the greatest unsolved plague. Practically each recurrence found the disease designated by a new name, until it was carefully studied and described as a definite pathological entity, apparently always present to some extent in all communities, and was named by the French "*La Grippe*" and by the English "Influenza." We have shortened the French term to "grip" and it has come to mean almost any kind of a cold, in popular terminology. But sight should not be lost of the fact that all modern textbooks on medicine use "*la grippe*" and "influenza" synonymously, and the promiscuous application of these terms to all mild affections of the respiratory tract should be discouraged in the interest of correct nomenclature.

**Infective Agent.**—That there is a specific organism capable of reproducing repeatedly the disease entity called influenza we cannot doubt. But its nature has not yet been determined. Some evidence seems to point to the Pfeiffer bacillus, or *B. Influenzae*, while other work would tend to indicate a filterable virus. One great life insurance company has supplied funds for an exhaustive study by a commission, composed of some of the leading experts of the country, from which we may hope for valuable results. In addition, many independent investigators are at work upon the problem.[1]

**Modes of Transmission.**—Since the disease affects the respiratory tract primarily in the majority of cases, it is

[1] The Rockefeller Research Institute has recently announced the discovery of a minute coccus that may be the causal agent.

reasonable to suppose that its spread is accomplished through droplet infection, while transference by the hands, by articles soiled with saliva and by kissing are also important. Exhaustive research in army camps and industrial plants, stores and restaurants points strongly to hand contamination as the principal mode of transmission. In the intestinal form the dejecta probably are infective. Because of the widespread prevalence of the disease, many have been lead to believe that it is "air-borne." But a careful study of the first cases appearing in a community has repeatedly demonstrated that contact between the sick and the well has occurred in practically every instance, and usually in the early stage, before the patient suspected that he had influenza.

The marked periodicity of influenza epidemics is an interesting feature. Large outbreaks occur approximately at intervals of a generation and last over a period of several years, during which time there seems to be a periodicity of about thirty-three weeks between successive peaks. The intensity of peak rises in the subsidiary outbreaks appears to be greater or less according to season. Each individual outbreak is ordinarily limited in duration to about a six weeks' period, from onset to subsidence. Its intensity seems to depend upon certain factors related to the crude death rate and the rates for tuberculosis, organic heart disease and nephritis. The higher these rates are, the more severe is the influenza epidemic. What bearing these various factors have on susceptibility has not as yet been determined, but they lead to interesting speculations which may bear fruit in time.

**Immunity.**—Apparently no one is naturally immune, the disease attacking the lower age groups principally for the reason that older persons have had previous attacks. Repeated attacks in the same individual are quite common, however, although one attack seems to confer a relative immunity upon the majority of persons.

**Incubation Period.**—Two to four days is the period required for incubation, with a larger percentage of cases developing in the shorter time.

**Diagnosis.**—Space need hardly be given to the subject of differential diagnosis, as it is one that is all too fresh in the minds of physicians today. A word of caution should be uttered against the prevailing tendency to diagnose every case of generalized body pains with fever as "flu." Since the passing of the pandemics, the authors have noted that several cases of smallpox have been allowed to spread infection by reason of such error in recognizing the prodromal symptoms.

**Methods of Control.**—One of the most widely debated topics of the day among sanitarians is the best method of controlling an outbreak of influenza and, judging from recent experience, the question can hardly be regarded as settled. To the frank case, in bed, can be applied the usual procedure of isolation and concurrent disinfection, while the immediate contacts can be held in quarantine for four days. But all of us have become familiar with the many mild and missed cases that are found abundantly and with the fact that nearly all cases, which later become well marked, are usually up and about during the prodromal stage. It is by reason of these facts that the disease gains such rapid headway in spite of our best efforts to control it.

At present the chief methods available for the health officer are (1) isolation of cases when found; (2) quarantine of contacts; (3) education of the public to remain at home upon the first appearance of suspicious symptoms, and (4) organization of the community for both relief measures and for the discovery of unreported cases. As a result of the thorough application of these principles, mortality at least, can be reduced and the case incidence spread out more evenly, thereby rendering it possible for relief agencies to reach all of those needing aid. In controlled groups, such as mines, factories and schools, daily inspection of all persons, by physicians or nurses, with isolation of suspicious cases, gives excellent results, provided that the chances for outside contact are reduced. In any event, such measures eliminate opportunities of acquiring infection while at work or at school and will safeguard those who otherwise make an effort to avoid exposure.

When all of the possible chances of exposure for a given individual are considered, the closing of places of public gathering hardly seems justifiable. If the other measures above suggested are faithfully carried out, strict closing of public places appears to have little effect upon the spread of infection, certainly, at least, in large centers of population. This is particularly true of schools, where daily inspection and the exclusion of suspects afford the children better protection and furnishes the health officer with information as to early cases. Doubtless, the ban on public gatherings will temporarily diminish the amount of the disease appearing, but will not prevent the ultimate infection of susceptibles, by reason of the fact that limitless chances for contact are everywhere present. The inconvenience and expense resulting from closing, therefore, do not justify the results obtained. This was well illustrated in one town under observation, during the epidemic of 1920, where the cases at no time reached a high peak comparable with other communities in the state, although all places of public gathering in the town were allowed to remain open. However, the other control measures above mentioned were effectively carried out. It is also interesting to note that other communities, where closing was rigorously enforced, during the general epidemic and which suffered only lightly at the time, had well marked outbreaks, as soon as restrictions were abated. In small rural communities, however, closure no doubt materially reduces the amount of contact, and so may be of value in distributing the peak load of the epidemic, if other control measures cannot be applied.

**Mortality.**—Deaths from influenza are rather infrequent as compared with those from the resultant pneumonia. It is toward the prevention of the latter complication that the health officer should especially bend his energies. Education of the people to protect themselves by going to bed early and securing adequate nursing care will do much to reduce this mortality. It is here that community relief measures, well organized beforehand, find their highest usefulness. Such an organization should develop around the health department as a center, in order that the health officer may guide it into proper channels and prevent the adoption of fads that waste time and money. We have come to the general conclusion that, while we are rather helpless to prevent *cases*, yet by proper organization of medical, nursing and other relief services we can materially reduce the *mortality* in epidemics. A plan of community relief organization for epidemics, designed with this purpose in view, will be found in the appendix.

A judicious use of antipneumococcus vaccine as a prophylactic against the subsequent pneumonia, with the full understanding that it will not prevent influenza, seems to reduce the mortality somewhat.

## 15. LEPROSY

From the earliest recorded history of China, India, Syria, Egypt and Palestine, down through the ages to our own day, the word "leper" has roused a shudder that no other disease inspires, by reason of the loathsome picture of decaying human flesh that it recalls. From Iceland to the tropics and from east to west, the leper can be found in varying numbers. In New England, Louisiana and California are found endemic centers of the disease that have existed for years. Dr. Frederick L. Hoffman has made the latest and most accurate survey of leprosy in the United States. He places the entire number of cases at not less than 400 and probably closer to 500.

While such a small number in itself would not be alarming, Dr. Hoffman points out that leprosy is insidious in its spread and that endemic foci may be established before we are aware of the danger, unless preventive measures are instituted. Once having seen a case, no one would hesitate to take every possible step to control the spread of such a disease. To quote Manson, "altogether, the blind, lame, unhappy wretch, still retaining his intellect, but devoid of every sense except that of hearing, breathing with difficulty through a stenosed larynx, and racked by neuralgic pains and irregular outbursts of fever, comes to present, before the inevitable death from exhaustion occurs, a sadder, more loathsome, and more repulsive picture than anything imagination could conceive."

**Infective Agent.**—There is some disagreement among authorities as to the discoverer of the specific organism of leprosy, but it would appear to have been identified in the period of 1870 to 1880, thus making it one of the earliest bacteria definitely associated with the disease which it produces. The *Bacillus leprae* has been generally accepted as the infective agent of leprosy, but several forms, either variations of the one organism or different species, have been observed. Animal inoculations have so far failed to solve the problem definitely and our principal evidence of specificity rests upon the constant presence of the bacillus in all leprous lesions, as well as in the blood in some cases.

The bacillus has also been found in the sputum and in the intestines, but not in the urine.

A feature of especial interest is the fact that the bacillus behaves much like the tubercle bacillus in staining characteristics and that the disease has many points in common with tuberculosis. In stained section of tissue the bacilli are often found arranged in a group resembling a bundle of cigars and lying within the cell. No other organism presents this peculiar grouping.

**Incubation Period.**—As in tuberculosis, leprosy appears to have a prolonged incubation, or latency, period. But its gradual onset makes impossible any definite determination of the exact time of infection. Figures varying from 2 to 27 years are given, but are unreliable.

**Immunity.**—In times past leprosy spread rapidly among non-immune people and even in recent decades it has devastated large groups. At present, we may say that an extremely high degree of immunity exists in nearly all of the world, although Dr. Hoffman's careful study indicates a slight increase of incidence in some quarters. It is possible that resistance has gradually been bred into the race through a long continued selective action.

In general the disease makes its appearance between the ages of 10 and 30. Whether infection usually takes place in early childhood, as commonly believed of tuberculosis, is a matter of conjecture.

**Modes of Transmission.**—No experimental evidence has been obtained to demonstrate the mode of transmission. Several instances are recorded in which the disease could be traced definitely from a given individual to another person; indeed, through an entire tribe in one case. Such facts lead us to believe that contact plays the chief role in infection. This is reasonable to suppose, when we consider that the bacilli are found abundantly in the nasal secretions and in discharging lesions of leprosy cases. Whether transmission is through sputum spray, or by direct inoculation of wounds, or by ingestion of bacteria, is unknown.

**Diagnosis.**—For a detailed discussion of diagnosis reference must be had to such works as are mentioned in the appendix, for the disease assumes many forms. Its principal sign is the development of anesthetic areas on the skin, which may be preceded by sensory disturbances of several kinds in the parts involved. A pale or pigmented spot, usually upon the trunk, face or extensor surfaces, the center of which is insensible to pain or touch, may be considered as pathognomonic, when accompanied by a suggestive history. Another feature often noticed is frequent nose-bleed and an ulceration of the cartilagenous septum of the nose. In the pure tubercular, or nodular type, it may be necessary to rely entirely upon history and microscopic findings during the early stages. Cases of the nerve type present thickenings along the larger nerve trunks that appear quite early. This can usually be demonstrated easily on the ulnar nerve just above the inner condyle of the humerus. The bacilli may be aspirated from a nodule by injecting a few drops of saline solution into it with a hypodermic syringe, and repeating the injection and withdrawal of fluid a few times. The solution is then spread upon slides and stained in the usual way.

Leucoderma is to be distinguished from leprosy by the presence of tactile sense in macules of the former disease. Syringo-myelia is sometimes confused with leprosy, but is distinguished by the absence of macules, of thickened nerve trunks and of enlarged lymphatic glands. Vitilligo may resemble leprosy, but is not anesthetic.

It should be urged, then, that a case giving a history of slowly progressive debility, often with remissions, and presenting nodules or macules upon some part of the body, should be carefully studied for the possible presence of leprosy.

**Methods of Control.**—The only method of control that is a real safeguard to the public and humane to the patient is segregation in a leper hospital, where the victim may receive treatment and proper care until cured or death relieves his misery. Isolation is obviously necessary, but isolation for life, at home, is generally out of the question. The infective discharges must also be cared for and this cannot properly be secured over such an extended period, without supervision.

Fortunately, Congress has provided the funds whereby the U. S. Public Health Service will be enabled to care for such lepers as may become a menace that cannot be controlled by the individual states. Plans are under way for the erection of a national leprosarium that will solve a vexing problem for this country.

Meanwhile, the leper must be held in such isolation as the local government can provide, receiving every possible care and consideration. The most feasible method, where a leprosarium is not available, is restriction of the patient's movements to the vicinity of his own home; exclusion from public gatherings and from occupations connected with the handling of food or domestic employment, and regular reporting by the leper to the local health authorities. If the latter fail to receive a personal report from the individual at the usual time, investigation should be made at once and steps taken to apprehend him, if he has departed from the health jurisdiction.

**Mortality.**—In the Louisiana Leper Home, for the period December 1894 to December 1915, 43.2 per cent. of the cases received have died, while 7.4 of all cases have been discharged as cured. It may be said that at least 90 per cent. of all cases will die of leprosy or intercurrent infections more or less connected with the disease. Some hope, however, of lowering this mortality has been roused by the work done in some of the larger colonies, where treatment seems to be making an impression upon many cases. Meanwhile, the medical profession should become sufficiently familiar with the signs of leprosy to make a tentative diagnosis, especially in those localities where cases are known to exist.

## 16. MALARIA

Somewhat over 2000 years ago, the first references to malaria made their appearance in Greek and Roman writings. It has been inferred that the disease was brought into these countries by returning soldiers or slaves. By the first century B. C. it had become so well established that medical writers distinguished the various types of infection and referred their origin to marshes and other wet places.

Malaria has played a prominent part in the histories of many nations and in their various undertakings. It has insidiously sapped the vigor of those that were once dominant in the world and may have contributed largely to their downfall. Some of the most fruitful places of the earth have been desolated by the ravages of malaria, coupled with yellow fever, until they have become bywords of pestilence and death. Our own Canal Zone was such a place until Gorgas transformed it. Even yesterday Guyaquil, Ecuador, bore the same unsavory reputation.

No discussion of malaria is complete without a reference to Sir Ronald Ross, of England. Working in a little laboratory in India, tried by many disappointments, his work ignored, often compelled to drop his studies for other duties, he still persisted in an apparently fruitless search until, on the 20th of August, 1895, he saw for the first time a malarial parasite in the process of development in a mosquito. The problem of transmission had been solved and a fact of inestimable value to the world had been firmly established. The story of his labors, as recounted in his own original work upon the subject, is a romance of science that should be read by every sanitarian.

To write anything approaching a full discussion of the subject is beyond the scope of this chapter. We can merely touch upon the important phases in outline form.

**Infective Agent.**—Laveran, working at Constantine, first discovered the specific organism of malaria in November, 1880. His work was followed by many others until the entire life cycle of the parasite in man had been described. But it remained for Ross to demonstrate that there were two phases of the life cycle, one in man and the other in mosquitoes.

Various names have been applied to the species, the most common of which was *plasmodium malariae.* Today the accepted designation is *hemameba.* There are three varieties recognized at present and corresponding to the types of fever that have long been known. They are *H. vivax* (tertian), *H. malariae* (quartan) and *H. falciparum* (estivo-autumnal). The parasite is a protozoon, similar in many respects to amebae. As suggested above, it passes through two distinct life cycles dependent upon the kind of host which harbors it. In man the phase is entirely asexual, reproduction taking place by both simple division and mitosis. Sexual forms are produced in human blood, but do not reproduce, so far as known. When taken into the stomach of a mosquito, however, they pass through a stage of development quite different from the other and are again ready for an asexual career in another human host.

As successive crops of parasites are thrown into the blood stream, we see the intermittent attacks of chills and fever so characteristic of the disease. The parasite grows only in or on the red blood cells and it is the destruction of the latter, with a probable liberation of toxins, which produces the usual symptoms, including anemia.

Many attempts have been made to find the organism in marsh water and to produce the disease by drinking such water or introducing it into the body in other ways. No such attempt has ever been successful. The *hemameba* lives only in the animal body and in that of the mosquito.

For a description of the parasite as found in human blood, reference should be made to any standard work on pathogenic microorganisms.

**Incubation Period.**—Experimental work throws no definite light upon the length of incubation. It is probable that several factors contribute to the development of an attack of fever, such as the number of parasites received, natural resistance, etc. We do know that experimental inoculations have shown incubation periods running from 5 days to several weeks.

**Immunity.**—It appears that no natural immunity to malaria exists. Certain persons seem to repel mosquitoes, due probably to body odors. Many who live in malarious regions acquire infection in infancy, gradually becoming immune.

Quinine taken regularly will produce artificial immunity so long as continued in sufficient dosage. The amount required depends somewhat upon the degree to which mosquitoes and malaria carriers prevail.

**Modes of Transmission.**—Aside from a few rare cases acquired in the course of blood transfusion, malaria is always transmitted by a mosquito. Moreover, only one sub-family of these insects is capable of this transfer, viz., *anophelinae*. There are about 25 recognized species in this group which may be vectors of malaria. They are commonly called the anopheles mosquitoes and have certain characteristics which distinguish them from others, as follows:

1. When the mosquito is resting upon a flat surface, the body is directly in line with the head and tilted at an angle of about 45°, instead of being bent downward so as to be parallel to the surface upon which the insect is resting.

2. The larvae lie parallel to the surface of the water, instead of at right angles, with the head down.

3. Wings are spotted.

4. Proboscis is in line with the body axis, when resting.

5. Palpae about equal in length to proboscis in both sexes.

6. Distinctly night flying.

Only the female has a taste for blood, which is necessary to the development of the eggs. She seeks man or other animals to satisfy this appetite and then flys to a convenient collection of water to deposit her eggs. The favorite spots selected are along the protected banks of sluggish streams, in ponds and in quiet pools or the water of empty cans, barrels, roof gutters, etc. In favorabe weather the young reach maturity within ten days, whereupon the females among them seek their fill of blood again.

When the mosquito withdraws blood from a malaria carrier or case, she usually receives a few of the sexual forms of parasite above mentioned. The male element undegoes certain changes by which parts of its body, corresponding to spermatozoa, are thrown off. These actively motile cells conjugate with the female bodies and a new generation of *hemamebae* is produced. They find their way into the so-called salivary gland of the mosquito and are injected beneath the skin of the next person attacked. The entire cycle in the mosquito requires from 7 to 10 days for its completion, and longer, if the weather is cool.

Thus we see that malaria really is associated with swamps and other wet places, but in a manner quite different from that formerly supposed.

**Diagnosis.**—In many parts of the United States malaria has been so common that physicians have frequently acquired the habit of calling any protracted fever or any debilitated condition "malaria." While a typical case can be diagnosed by clinical symptoms, as a rule, yet many an atypical case has been overlooked and many other conditions have been erroneously classed as malaria. In the minds of many there seems to be a hazy notion that malaria simply designates any vague group of symptoms having fever and lassitude as their principal features. Yet the majority of cases can be easily diagnosed by a simple microscopic examination of the blood. Any public health laboratory can usually do the work in 15 minutes and physicians should acquire the habit of using the microscope themselves or of sending a specimen to the laboratory before diagnosing malaria definitely. It should always be borne in mind that even 2 grains of quinine will temporarily drive the parasites from the peripheral circulation. If the drug has been taken, a wait of 48 hours, or longer, should elapse before an attempt at microscopic examination is made.

Another feature of importance in malaria is the enlarged spleen. This is taken advantage of in making a rapid survey of children for infection.

**Methods of Control.**—Three general lines of activity present themselves as available in whole or in part for the control of malaria. They are mosquito eradication, screening and quinine prophylaxis.

Since the mosquito must have quiet water for the development of the larva and pupa, drainage offers an excellent means of control. When drainage cannot be accomplished, it is possible to take advantage of the fact that the larva is an air breather and a film of oil is floated over its habitat, killing it by suffocation. It is also practicable to use a poison for the larvae in some areas. Again certain kinds of fish eat the larvae readily and can keep a pool of water clear of them, if the edges of the pool are cleaned thoroughly of all protecting vegetation. Many small collections of water can be removed by filling all depressions in the ground surface. About the premises of a house are many accumulations of standing water that require emptying or screening, if mosquitoes are to be wholly eradicated. An old tin can full of water will breed hundreds of the pests in a season.

Screening prevents the mosquito from reaching those who are well and from acquiring parasites from the sick. It is an excellent measure that has accomplished a marked reduction in malaria incidence wherever thoroughly applied. But it must be thorough to be effective. A screen of 16 meshes to the inch is necessary to keep out anopheles and no breaks or cracks can be left anywhere. Even the chimney must be screened in places where mosquitoes abound. Not only should the house be screened, but netting should be used over the bed, for anopheles bites a sleeping person by preference. Netting so used should be tucked in under the mattress and should have no break in it anywhere.

In some places quinine prophylaxis alone has been exceedingly effective in reducing malarial infections. To be worth anything at all, the drug must be taken constantly during the mosquito season. In the malaria patient it keeps the peripheral circulation free of parasites and in the non-infected individual it is distinctly a preventive. Observers in highly malarious regions have noted that larger doses of the drug are needed to produce this effect than would be required in districts of moderate or low incidence.

The average effective dose is 5 to 7 grains daily for as long as the mosquito is present. An exceedingly important point in the control of malaria by the use of quinine is the complete sterilization of cases as far as the parasite is concerned. Too often the physician or patient relies upon the disappearance of symptoms as an indication of cure of the case, when in reality the parasites have only been diminished in number. Treatment should always be continued over a sufficient period of time to make certain that the destruction of parasites is complete, and the microscope should be used as a check.

Many factors must be considered before any one or all of these measures are applied. The amount of infection is important, as extensive drainage operations might not be justified in the presence of a light infection, while it would easily repay the cost in other localities. Intelligence and cooperation on the part of the community would affect the success of wholesale screening or quinine administration. Economic considerations often enter in, such as the loss of productiveness of land due to physical disability of the occupants or removal of tenants on account of malaria. The question would arise, whether increased production would offset expense of preventive measures. These serve to illustrate the fact that an experienced engineer should be consulted before other than the simplest measures are attempted.

For a complete statistical study of various phases of the problem reference should be had to the excellent essay of Frederick L. Hoffman, "A Plea and A Plan for the Eradication of Malaria" (Prudential Insurace Company).

**Mortality.**—Ross states that in India alone malaria has an estimated death rate of 5 per 1000, or total deaths of 1,130,000 annually. While not so great as this, the mortality in our southern States is high. And we must add to this a host of anemic, debilitated persons who will fall easy victims to other diseases.

Aside from its mortality malaria is a prominent cause of economic loss to the nation by reason of sickness and reduced efficiency. Wherever it is found the unhappy sufferers should be given the benefits of all that science has learned concerning the eradication of this plague, for it is preventable, if intelligently and persistently attacked.

## 17. MALTA FEVER

Generally speaking, Malta fever is quite rare in the United States, but it holds an especial interest for the states on the southern border in that it prevails to some extent in Mexico. The disease is so named from the fact that its greatest incidence is in Malta and along the Mediterranean littoral. But many cases are found in India, China, the West Indies, Brazil and elsewhere. While not the cause of any appreciable mortality, Malta fever is extremely debilitating, producing considerable economic loss to the patient thereby. It is also confused with other diseases, especially in its early stages, so that the possibility of its presence in certain localities should be kept in mind.

**Infective Agent.**—Bruce, working in Malta, demonstrated the specific organism of Malta fever in 1887. To it was given the name *Micrococcus melitensis*, because of its minute, globular form and the most prominent focus of the disease.

The organism is common to both man and the goat. In the former it may be found in the blood stream, during an acute attack, while it is present in the urine and in nearly all of the organs, at any time during the course of infection. Goats carry the micrococcus in the same manner and discharge it through the urine and milk.

Sunlight and drying are fairly destructive to the organism, but it can survive in milk and water for several days.

**Immunity.**—Some difference of opinion exists as to the immunity produced by an attack of Malta faver, probably due to recurrent attacks in the majority of patients. However, a moderate degree of immunity results from vaccination with a killed culture of the micrococcus, so that we are led to infer such an action from an attack of the disease. The facts in this respect have not been fully established as yet.

**Incubation Period.**—Many persons appear to carry latent infection for a considerable period, so that no definite statement as to the incubation period can be given. We do know, however, that some cases have developed within six days after the patients had taken up residence in Malta.

**Modes of Transmission.**—Most important of all media of transmission is the milk of an infected goat. In this manner the disease has been kept alive for generations along the Mediterranean. In the southwestern United States cases have been reported in persons engaged in goat herding and the disease is known to prevail among goat herds in New Mexico, Texas and Mexico.

The infective agent is also discharged in the urine of goats and may survive in water for a short while, so that we can, at least, suspect ponds of standing water that are used for drinking purposes, by both man and goats, as being the occasional source of a case.

Contact cannot be wholly eliminated, although the evidence for its effectiveness in spreading the infection is scant. Patients suffering with the disease are known to discharge the micrococci in their urine and may thus contaminate articles handled by other persons.

**Diagnosis.**—The early stages of a case of Malta fever are quite similar in many respects to typhoid fever. Initial temperature, headache, anorexia, are identical. Rose spots, however, are absent and constipation is present, offering a hint at the differential diagnosis. As the disease progresses, the fever declines by gradual steps, quite unlike typhoid. Often, pains similar to rheumatism develop and the joints may be affected exactly as in acute arthritis, with one after another partaking of the inflammatory process. Neuralgic pains and orchitis are also frequent accompaniments of the more chronic stage of infection. Attacks of fever alternate with periods of apyrexia, or the temperature may be remittent. Occasionally cases present a continued fever for weeks, similar to a septic process.

Malaria and tuberculosis must be distinguished from the disease. This is usually easy, after the process has continued for a few weeks.

In the laboratory a blood test similar to the Widal for typhoid fever will offer indication of the nature of the infection, by the end of three or four days after acute symptoms have presented. Blood culture is also positive during this state.

The outstanding features of diagnosis are remittent, or intermittent, fever, pains of rheumatic nature, neuralgia, orchitis, splenic enlargement, extreme debility, and a course extending over months or years.

In addition, a history of using goat's milk, or of having to do with the care of these animals, is suggestive.

**Methods of Control.**—Since goat's milk is by far the most important vector of *M. melitensis*, the proper control of this food will check infection of human beings. A herd that is suspected should be examined by bacteriological methods, remembering that 50 per cent. of goats show no signs of disease. All animals found to be harboring the organisms should be isolated or killed. If killed, their meat should be thoroughly cooked before being used for food. Milk of segregated animals should be kept entirely separate from that of the rest of the herd and should be boiled before being used for any purpose, including the feeding of other goats. Kids from infected mothers should be segregated immediately after birth and examined for infection. They should be fed only pure milk, if found not to be infected.

Patients suffering with the disease should be instructed as to the disinfection of the urine.

Water used by human beings for drinking purposes should be fenced to prevent contamination by goats.

**Mortality.**—The mortality of Malta fever is quite low, not running over 2.5 to 3 per cent. of cases. Its debilitating nature, however, would predispose to other infections, aside from lowering efficiency and causing economic loss.

## 18. MEASLES

Since smallpox has been brought under greater control, measles deserves first rank among infectious diseases in the number of cases arising from it in the United States and Canada. For only a negligible portion of the population is naturally immune and the mortality caused by measles is higher than is commonly believed.

**Infective Agent.**—While the specific organism has not yet been isolated, considerable laboratory work has demonstrated that it is carried in the blood, just before and after the eruption appears, and that it is found in the saliva at about the same time.

**Incubation Period.**—Following the injection of infected blood into monkeys, a period of fourteen days elapsed before the exanthem was detectable. Consonant with this, epidemiological investigations have shown that approximately ten days intervene from the date of exposure to the first symptoms and fourteen days to the rash, taking an average of cases. There are a few days variation on either side of this figure.

**Immunity.**—Not more than ten per cent. of the population, at a liberal estimate, is naturally immune, including all ages. Immunity in the higher age groups is due to early infection.

**Modes of Transmission.**—There is no valid evidence that there is a carrier problem in the transmission of measles. It is common experience, borne out by research, that the pre-eruptive stage is the most highly infectious and that the danger diminishes as the temperature returns to normal. It is extremely doubtful if the case is infective after the eruption is completely developed. The fine, branny scales that follow the disappearance of the eruption have been shown to possess no infectivity. It is the developing case, then, that distributes disease, often before a diagnosis is made.

Droplet infection is probably the means by which the virus is transferred from sick to well, as it is quite common to have a history of a child playing with another who had a "cold." Transference of the fresh virus by the hands, or by kissing, is also to be considered.

**Diagnosis.**—There are two essential points with reference to diagnosis in measles. First, that it should be made early, and second, that differentiation should be made from other exanthemata.

The fact that measles is most contagious for several days before the appearance of the eruption makes an early diagnosis imperative, in order that there be an early isolation. The presence of a punctate eruption on the palate and pharynx indicates oncoming measles. This eruption cannot be described easily, but once seen, it is never forgotten. This prodromal eruption is distinct from Koplik's spots, which are seen as the skin eruption develops. It should be recalled that Koplik's spots are few in number; that they appear on the buccal mucous membrane opposite the biting edges of the teeth, and that they are small dark red spots with bluish white centers. Other prodromal symptoms, as coryza, inflamed eyes, a temperature of 102–105 (which often remits on the day before the rash), must be considered in connection with the appearance of the palatine mucosa.

The eruption on the skin is characteristic and is described in all text books on medicine. It is sometimes confused with mild smallpox. But this should not occur if it is remembered that the latter gives a hard, shot-like swelling, while the measles rash has a soft, velvety feel, with very little induration. Distribution of the eruption in measles is on the face and trunk, primarily, while that of smallpox is on the face and extremities.

**Methods of Control.**—Immediately upon recognition of suspicious symptoms, the patient should be isolated, particularly from non-immunes. Concurrent disinfection of all discharges from the nose and throat should be complete. Five days isolation, from the date of onset, is sufficient, as infectivity generally ceases within this time.

Contacts who have not had the disease should be excluded from school and from public gatherings and separated from non-immune children. If it is possible to determine exactly the date of first exposure, a contact might safely be allowed full liberty, including attendance at school, for a period of seven days, as it has been satisfactorily demonstrated that infectivity does not begin in any case until a minimum seven day period has elapsed. He could then be quarantined for seven to ten days, which would allow of ample time for prodromal symptoms to develop. However, this procedure can be used safely only by a well organized health department or school medical inspection service. If the date of contact cannot be definitely established, it is safer to quarantine contacts for at least fifteen days.

In the event that a case of measles develops in a school child, daily inspection of all other children, before they mingle in school, will help to suppress further spread. The teacher can assist greatly by excluding suspicious cases and no difficulty should be experienced in instructing teachers to recognize such symptoms as would justify exclusion.

There must be continuous and positive education of the public as to the danger of exposing children to those who present symptoms of "cold." That the child is "bound to get the diseases of childhood and may as well have them early," is a popular fallacy that the health officer should combat. The longer the infection can be postponed, the lower is the death rate.

**Mortality.**—There is considerable misunderstanding of the mortality of measles. While the disease itself does not often kill, its complicating pneumonia, together with other less frequent sequelae, produce a death rate among the acute contagious diseases second only to diphtheria and whooping cough. During the period 1910–1919, the death rates for the four principal diseases of this class, for the Registration Area of the United States, were:

| | | |
|---|---|---|
| Diphtheria | 16.75 | per 1000 of population |
| Whooping cough | 10.3 | per 1000 of population |
| Measles | 9.3 | per 1000 of population |
| Scarlet fever | 5.6 | per 1000 of population |

In 1917, there were 10,745 deaths recorded for measles, in the Registration Area, and this number was probably much lower than the actual deaths, as many physicians forget to enter measles as the primary cause of death, on the certificate, when the terminal cause is pneumonia. Health officers should abandon the old *laissez faire* policy of handling measles and recognize it as an important cause, not only of deaths, but of subsequent physical defects. We are justified in combating this disease by every means in our power and should especially endeavor to overcome the public's false conceptions concerning it.

## 19. EPIDEMIC CEREBROSPINAL MENINGITIS

Considerable confusion prevails due to the fact that the term "meningitis" has both a general and a specific meaning. In the former case it applies to any inflammation of the cerebral or spinal meninges, while in the latter it designates that disease which is caused by the meningococcus. It is in this specific sense that the term is used here. For want of a better name, we speak of "epidemic cerebrospinal meningitis." In several features the disease is similar to poliomyelitis, particularly in respect of the widespread prevalence of carriers, as compared with cases, and in the periodicity of epidemics. On the other hand, our information as to epidemic meningitis is more complete than that on poliomyelitis.

**Infective Agent.**—The organism producing epidemic meningitis is the *Diplococcus intracellularis meningitidis*, commonly called the meningococcus. Under the microscope it is indistinguishable, with ordinary stains, from the gonococcus, being found within the polynuclear cells, as its name implies. The organism grows readily on properly prepared media, but dies quickly if allowed to dry. Hence it is necessary to transfer swabbings from the nasopharynx to the plates immediately.

**Incubation Period.**—The incubation period is somewhat difficult to determine, as it varies within certain limits and some persons appear to carry the organisms for a considerable time before succumbing to infection. For practical public health purposes the limit is placed at 10 days.

**Immunity.**—Susceptibility to meningococcus infection varies with the individual at different times and also with the strain of organism present. It is apparently affected by crowding, with its necessarily greater exposure, and by the number of cases prevalent at a given time. Also, persons coming from a locality that has been free from the disease for a period are more susceptible than those who live in communities in which it is more or less constantly present. For this reason, rural districts suffer more severely than do urban, in epidemic outbreaks.

In the majority of cases, one attack appears to confer immunity.

Some little work on prophylactic vaccination against the disease has offered encouragement for further study.

**Modes of Transmission.**—Since the meningococcus is constantly found in the nasopharynx, sometimes in the anterior nares and mouth, and occasionally in the sputum, it would appear that the disease is acquired by droplet infection. It can be transferred on articles soiled with very fresh secretions of the mouth and nose, as well as by kissing.

By laboratory examinations made in various outbreaks and at other times, it has been repeatedly shown that carriers outnumber active cases, sometimes to a marked degree. The convalescent case is always a carrier for a period of at least two weeks following subsidence of symptoms. Practically all persons who have been in contact with a case are carriers for a period of two weeks to several months. These passive carriers give rise, in turn, to fresh secondary carriers, who, however, usually lose their virulent organism rather rapidly. But an endless chain is thus set up which may prolong the epidemic until all susceptible material is exhausted, if no control measures are instituted.

Added to the carriers are the mild, missed cases, which are more numerous than is generally believed, particularly in an extensive outbreak. The two combined present a formidable problem to the health officer.

**Diagnosis.**—A few diagnostic features of importance are enumerated below. Textbooks on the practice of medicine should be consulted for a more complete discussion.

1. The patient becomes sick suddenly, with high and variable temperature, vomiting, rapid appearance of herpetic eruption on the lips, and signs of an irritative involvement of the central nervous system. There is usually some sore throat and a rash may appear, resembling some of the common eruptive fevers.

2. After a day or two, lumbar puncture will reveal a turbid fluid under increased pressure. It is often possible to find the organisms in this fluid and to confirm the diagnosis at once.

3. One writer has recently reported finding the diplococci in the leucocytes of an ordinary blood smear. Whether this is constantly true remains to be demonstrated, but is worth investigating.

4. If laboratory facilities are immediately available, a culture from the nasopharynx will often confirm the diagnosis. It is important to note that in taking a swabbing for this purpose, the swab must be passed directly back to the posterior wall of the nasopharynx, either through the nose or behind the uvula, and immediately withdrawn, without being contaminated by touching other parts. The matter thus collected must be streaked on the culture medium at once. For a complete description of technique, see Simon's Human Infection Carriers.

It has been repeatedly observed that many inflammatory conditions of the throat prevail in the presence of an epidemic of meningitis. Whenever these cases have been studied bacteriologically, it has been discovered that many of them yield cultures of the meningococcus. Thus it is apparent that such cases should arouse the suspicion of health officer and physician, for cases of this kind have often been shown to be the most likely sources of active cases of the disease. Positive diagnosis of these cases can be made only by laboratory examination, but, in the presence of an active case or an epidemic, such symptoms should lead to a provisional diagnosis of meningococcal infection, for the protection of the public health.

**Methods of Control.**—Cases of meningitis must be strictly isolated and all discharges from the nose and throat burned. The nurse must attend carefully to the cleansing of her hands. Release of a patient should not be permitted until the throat is free of the organisms, or, if laboratory facilities are not availabe, until all symptoms have been absent for at least a week.

The health officer's most serious problem is the carrier. All persons who have been in contact with the patient must be quarantined until repeated laboratory tests show none of the organisms in the throat or nose. If a laboratory is not accessible, such contacts must be held for at least ten days. Contact in this case should be held to mean every person who has in any way been exposed to the patient, dating from about three days preceding the onset of symptoms. Careful inquiry should also be made among all associates of the patient for evidences of sore throat or for other indications of a mild attack of the disease.

In the presence of a possible outbreak, the health officer can do much to lessen the prevalence of cases by educating the public in personal cleanliness, especially the avoidance of common cups and towels, as well as by efforts directed at the relieving of congested housing conditions. Prompt action at the first appearance of a suspicious case, coupled with the utmost energy and thoroughness in tracing all carriers, are the requisities for successful control of meningitis.

**Mortality.**—In some outbreaks the mortality runs as high as 50 per cent. of cases. It varies, however, due to factors which are as yet little understood. Those who recover are often left with serious impairment of one or more of the special senses, or of the mentality.

By preventing the development of secondary carriers, the health officer can do much to rob the disease of its terrors for the community at large.

## 20. MUMPS

Mumps is not of public health significance because of its mortality, which is negligible, but because of the protracted period of disablement resulting and the serious complications frequently produced in the reproductive glands, leading sometimes to sterility.

**Infective Agent.**—The specific organism has not been isolated, but it has been demonstrated that the secretions of infected salivary glands contain it and will transmit the disease.

**Immunity.**—Before the age of five and after fifteen, there appears to be a decreased susceptibility. One attack usually confers immunity for life. Some promising work has been done recently which would indicate that artificial immunization may be produced by the use of convalescents' blood.

**Incubation Period.**—Epidemiological investigations have shown rather conclusively that the incubation period varies little from 21 days, although many textbooks still give it as ranging from 5 to 25 days. The latter figures are probably based upon faulty histories of exposure.

**Modes of Transmission.**—It is quite apparent that infective saliva is the medium by which the disease is disseminated. Droplet infection probably ranks first, followed by transference of the fresh virus on hands, articles used in common, and by kissing.

**Diagnosis.**—Diagnosis presents no particular difficulty, once the swelling just below and slightly in front of the ear lobe has made its appearance. Combined with moderate fever and more or less pain on swallowing, it could hardly be confused with any other condition, except a possible abscess in approximately the same region. The submaxillary or sublingual glands alone may sometimes be the primary site of infection.

Invasion of the testicles, ovaries or, occasionally, the mammary glands, should be guarded against. Also, a complicating mastoiditis, though exceedingly rare, must be borne in mind.

**Methods of Control.**—The patient should be isolated from the first appearance of suspicious symptoms until the parotid and submaxillary glands show no further evidence of inflammation. This period may vary considerably in different individuals.

Concurrent disinfection of discharges from the mouth, and of articles soiled with them, must be practiced.

After 18 days have elapsed, from the date of first exposure, a non-immune contact should be quarantined for one week, if such a procedure is practicable for the health organization. Otherwise, quarantine should run for 22 days.

Children showing suspicious signs should be immediately excluded from school and placed in provisional isolation and observation.

**Mortality.**—As a result of mastoiditis or meningeal involvement, or due to heavy toxemias, a death from mumps may occur, but the general mortality of the disease is nil.

## 21. PEDICULOSIS

**Infective Agent.**—Three well defined varieties of pediculi, or lice, are recognized: the head louse, *pediculus capitis;* the body louse, *pediculus vestimenti,* and the one infesting the pubic region, *phthirius inguinalis.* The second of these is the far-famed "cootie," that furnished exercise for the A.E.F., while at the front. In labor camps it is usually termed the "gray-back." All three organisms belong to the same family, but have certain anatomical differences and each has a special habitat. The parasite produces an intense itching, at times, and the scratching of the affected parts eventually results in the formation of infected areas upon the skin.

The head louse lays its eggs, commonly called "nits," along the hairs, fastening them there with a sticky exudate. Crops of new parasites are constantly developing from these eggs.

The body louse inhabits the seams of clothing worn next to the skin and comes out only to feed on its host. Its eggs are deposited in the clothing also. Only rarely is one of these parasites found on the skin, when a patient is examined, unless he is heavily infested.

The pubic louse, or "crabs," is found mainly in the hairy portion of the pubic region. It fastens itself to the hair and buries its head in the follicle. Eggs are deposited on the hairs, as with the head louse.

**Incubation Period.**—The ova hatch out in from 5 to 6 days. Sexual maturity, and reproduction of another generation, is reached in from 3 to 4 weeks.

**Immunity.**—Persons who are cleanly in their habits seldom acquire the condition.

**Modes of Transmission.**—What is said of the transmission of scabies applies as well to pediculosis. Close contact, or the wearing of an infested person's hat, in the case of the head louse, is responsible for dissemination of the parasites.

**Diagnosis.**—Diagnosis consists in finding the parasite, or its ova. Both are readily seen with the unaided eye. Ova on the hair slide along the hair shaft.

**Methods of Control.**—Personal cleanliness is the principal method of prevention. Children who are infested must be excluded from school until free of parasites. There should be no exchanging of hats or use of common coat hooks in school buildings. Education of those who are neglectful of personal cleanliness is important in ridding a community of pediculi.

**Mortality.**—There is no mortality from pediculosis. It is important to note that the body louse is the transmitting agent of typhus fever.

NOTE: Methods of delousing are described in the appendix.

## 22. PELLAGRA

About 14 years ago the medical profession of the United States became alarmed at what seemed to be a marked increase in the prevalence of pellagra. Many theories of its etiology were advanced and much research work was done to determine its cause. From the mass of data collected then and since, we have come to believe that the evidence is rather convincing for food deficiency as the principal factor in the production of pellagra. Just why we should have beriberi in one case and pellagra in another, has not yet been answered. But that they are all prevented, or cured, by adding certain principles which have been lacking in the diet, seems to be established beyond doubt.

It is, of course, a fact that a well developed case of beriberi or pellagra often responds only partially, or not at all, to such treatment. On first thought this would appear to refute the argument just mentioned. When, however, we examine the pathology of these affections, it is evident that no repair of permanently degenerated nerve tissue could be expected. And we do know that cases which show no signs of such permanent destruction can be cured in the manner stated, while communities in which the disease has regularly prevailed can be freed of it entirely by establishing the proper dietary regimen.

**Cause.**—As has been suggested, the cause of pellagra appears to be a lack of certain "accessory food substances" in the diet. When these are supplied, the disease subsides and rapidly disappears from affected areas.

Goldberger produced 6 cases of pellagra in a group of 11 convicts by feeding them for 5 months upon a ration composed almost entirely of corn grits, sweet potatoes and gravy. It was just such a diet as is employed by a large portion of the population in our southern states, where the disease is most prevalent. Goldberger then cured his cases by feeding a well balanced ration. At the time of these experiments, he also rid some orphanages of pellagra by changing the diet, without making any other alteration in the mode of living or environment.

While corn has frequently been incriminated as the causative agent in producing pellagra, many have developed the disease who did not use this food at all. However, the disease has been largely associated with those regions where corn formed a large part of the diet and doubtless contributed to disease production in a negative way by its universal use to the exclusion of other essential foods.

**Diagnosis.**—Digestive disturbances, weakness, dermatitis and mental changes are the outstanding features of pellagra. Of these the skin lesion is most characteristic, appearing as a reddening of the epidermis, much resembling sunburn. This may progress to a marked inflammatory reaction, with the formation of scales, blebs, small ulcerations, etc., or it may remain merely as a brown pigmentation. Distribution upon the more or less exposed surfaces of the body is constant.

Many physicians in the South depend upon changes in the disposition of the patient for the first signs of pellagra. Usually the temperament is altered, periods of depression develop and even a state resembling early paranoia or a manic depressive psychosis may supervene.

Dr. W. F. Wittwer, who has worked with the disease in New Mexico, finds mild digestive disturbances, with pain in the epigastrium, to be the initial symptom. He has also found a peculiar lack of elasticity in the subcutaneous tissue characterizing many cases.

Another sign that is commonly present in a later stage of the disease is the denuded, ulcerated and painful condition of the mucous membrane lining the mouth and pharynx.

**Prevention.**—A well balanced diet, containing the essential vitamins, will prevent pellagra and cure an incipient case. Milk alone, if used to the amount of 2 or 3 quarts a day, will suffice for this purpose. Some southern health officers are inducing families liable to pellagra to keep a cow and to use the milk freely. This plan has met with apparent success in several localities.

Public health nurses can do much to educate the families whom they visit in the proper selection of food. Often the only reason for falling into a onesided diet is ignorance, usually coupled with slovenliness or poverty. Patience and persistence will overcome these tendencies, sometimes aided by outside assistance in cases where poverty is a factor.

**Mortality.**—Pellagra has a case fatality rate of about 5%. Goldberger estimates, from deaths reported in the southern states, that there were probably 100,000 cases of the disease in the United States in 1916. The tendency has been toward a gradual increase, which should be combated by every live health officer through education of the public in the matter of a balanced dietary.

## 23. PLAGUE

Under date of June 22, 1920, the Surgeon General of the United States Public Health Service sent out a statement to the press of the country which had this to say in part:

> "Entirely in accordance with the forecasts made by the Public Health Service over a year ago, bubonic plague has made its appearance in the United States. At the moment, foci of the infection are known to exist at New Orleans, Penascola and Galveston, and in Tampico and Vera Cruz, Mexico. In Vera Cruz, the disease appears to have assumed the proportions of an epidemic."

Shortly afterward, he could have added a few other port cities to the list of foci in the United States.

This offers an excellent illustration of what was said in connection with cholera, that these diseases are a constant menace to the world, held back only by the unceasing vigilance of our national public health authorities. Within recent years the disease appeared on our Pacific coast, but was stamped out by a concerted attack upon the carriers of infection.

In man, and perhaps the lower animals, plague assumes three forms; bubonic, pneumonic and septicemic. The first is most common, while the second may appear in circumscribed outbreaks. Usually the septicemic form is a terminal condition of the other two, although it may be the primary form of the infection in occasional cases.

**Infective Agent.**—During an epidemic of the disease in China, Kitasato and Yersin simultaneously discovered a bacillus which was later proved to be the specific organism and was named *Bacillus pestis*. It is closely related in character to the infective agents of swine plague and chicken cholera. In the bubonic type of the disease bacilli are found abundantly in the lymphatic glands affected. Pneumonic cases show these organisms in the sputum and they may be found in the blood of patients suffering with the septicemic form of infection. The bacillus does not live outside of a living body, excepting on culture media in the laboratory. Drying, light and heat kill it easily.

**Immunity.**—One attack of the disease usually protects for life. A vaccine has been developed within recent years that gives a fair degree of immunity for a short while. If it does not avert the disease entirely, it usually modifies the course quite favorably. A serum has also been used as a therapeutic agent, but nothing is said of its prophylactic value.

**Modes of Transmission.**—Plague is primarily a disease of rats and of other rodents. Its propagation among human beings depends almost entirely upon this fact, for an attack upon these animals, if properly conducted, will cut short an epidemic. The infection may exist for a long period among rats, before it makes its appearance in persons living in the same locality. And between epidemics, in those places where plague prevails, the rats may always be found to be infected. Many of them carry a chronic form of the disease, thus continuing as foci of infection for other rodents and for man, over a considerable period.

The agent by which plague is transmitted to man is the rat flea. Fortunately, these vermin do not feed on man by preference, but only occasionally, else we should have even more devastating epidemics than are usual. In rat infested premises, however, the flea does travel from rat to man, as well as from rat to rat, carrying in its digestive tract many thousands of bacilli. The latter have a peculiar ability to penetrate the skin through minute abrasions, so that infection through the flea bite is readily accomplished. The organisms are either deposited on the skin with the flea's dejecta, or introduced directly by regurgitation at the time of biting.

As has been said, other rodents may acquire the disease and transmit it to man in the same way. At the present time, plague is prevalent among ground squirrels in California and may make its appearance in man if conditions favoring the invasion of human habitations by these rodents should arise.

Pneumonic plague is usually a complication of the bubonic type, in the first cases appearing, but is then disseminated by sputum spray. In this form it is highly contagious.

However, the British Plague Commission studied the disease in India and concluded, after exhaustive investigation, that not more than 3% of all cases could possibly be attributed to contact. Single cases of bubonic plague often occur in a family, although all members have been living in the closest contact and amid most insanitary conditions. When several cases occur in a family, they are usually simultaneous, denoting infection at the same time.

Thus it will be seen that transmission depends upon the rat. The same may be said of control measures.

**Diagnosis.**—In the midst of an epidemic diagnosis of plague is made without difficulty. However, the health officer must be prepared to diagnose the *first* cases, and to do so successfully he will have to resort to the laboratory. Fluid withdrawn from an inflamed lymph node, by puncture, will usually be found to be crowded with plague bacilli. Direct smears from suppurating buboes will also show the organisms. *Post mortem* they can be found in the heart's blood and spleen quite readily. If doubt exists, material from these sources should be inoculated into rats or guinea pigs, where the disease will make its appearance quickly. An especially useful method of inoculation is to shave the abdomen of a guinea pig with a dull instrument and rub the suspected material, or culture, upon the abraded skin. As was said, *B. pestis* penetrates an abraded skin with ease, while other organisms do not pass so readily. Thus a differential filter is produced, which will distinguish plague in a few days.

Direct smears of sputum in the pneumonic type will reveal immense numbers of plague bacilli. Sputum may also be used in the same manner as other pathological material mentioned, for the purpose of laboratory diagnosis.

In any suspected outbreak of plague we are particularly interested in detecting the disease among rodents. It is necessary, then, to have an idea of the *post mortem* appearance of lesions produced in these animals. Those who have had wide experience of this sort give the following features as of especial importance, in the order named.

1. A diffuse pink color of the subcutaneous tissues, due to hemorrhagic infiltration.
2. Enlargement of the superficial lymphatic nodes, with surrounding edema and hemorrhagic areas.
3. Liver mottled, with hemorrhagic and yellow, necrotic areas.
4. Excess fluid in the peritoneal cavity.
5. In chronic cases, abscesses of lymphatic glands and purulent or caseous foci in the spleen.

**Methods of Control.**—Plague control is synonymous with rat extermination. This is self evident, but its practical application must be supervised by persons trained in the best methods of rat catching and rat proofing. The rodent itself is trapped, poisoned or shot. All food is protected from rats, thus driving them to seek nourishment away from dwellings. Buildings of every description are made proof against the ingress of rats, depriving them of shelter and nesting places and forcing them to go elsewhere. By applying these principles a community may be thoroughly rid of rats in a short while, but there can be no relaxation of watchfulness, if it is to remain free of the pest. Deratting is not only good sanitation, but good business, for the economic loss caused by the depredations of these animals amounts to an enormous sum, estimated for the United States to be $180,000,000 annually.

When expert advice cannot be had, the best method of rat extermination is by poisoning. Because of the economic, as well as sanitary, significance of the rat, the following directions for preparing poison, as given in a recent bulletin of the Public Health Service, are reproduced in full:

"In exterminating rats, either by poisoning or by trapping, it is important to bear in mind that success depends largely on the degree to which the removal of other foods makes the poisoned bait or the bait in the traps attractive to the rat. A variety of poisons may be used, barium carbonate, phosphorus, arsenic, and others, but even with an efficient poison, failure often results through lack of attention to details.

### How to Use Barium Carbonate

I. KIND OF BAIT. Three or more kinds of bait should be used. Each must be mixed separately with barium carbonate. One kind of bait from each of the following classes should be used:

1. Meat or other animal substance; such as Hamburg steak, sausage, canned salmon, eggs or oysters.
2. Fresh fruit or vegetable food; such as cantaloupe, tomatoes, green corn, baked sweet potatoes, bananas, etc.
3. Miscellaneous foods, milk or cheese, peanut butter, bread, cake, cereals (raw or cooked).

II. HOW TO MIX. The barium carbonate must be thoroughly mixed with the bait, so that the rats cannot eat the smallest portion of the bait without getting some of the barium carbonate. In the case of such substance as Hamburg steak, cheese, etc., use one part of barium carbonate to 4 parts of bait. Mix thoroughly with a spoon.

Substances which cannot be thoroughly mixed with the barium carbonate as just described (for example, cantaloupe, tomatoes, etc.) should be cut into small pieces and thoroughly covered with the barium carbonate, and then worked in with a knife.

III. HOW TO SET POISON. The three kinds of bait, prepared as above, should be divided into small portions about a teaspoonful each and placed freely about premises, alternating baits 1, 2, 3. It should be set at short intervals, not over ten or fifteen feet. DO NOT MIX THE DIFFERENT KINDS OF BAIT WITH EACH OTHER.

IV. GENERAL INSTRUCTIONS. The morning after baiting, look for dead rats and remove them. Take up baits. Examine these so as to see which have attracted most rats. If any kind of bait has not been touched, use a different bait instead of this. Fresh bait should be used each night.

V. HOW OFTEN TO BAIT. Bait every night, as long as rats continue to eat bait.

VI. CAUTION. Keep fowls, dogs, cats, etc., away from bait.
ANTIDOTE. An emetic, followed by Rochelle or Epsom salts."

For the eradication of other rodents, special measures may be necessary, such as the use of poison gas in their burrows. The exhaust gases from gasoline engines have been successfully used for this purpose.

In a case of the pneumonic form of plague, every care must be taken to prevent the diffusion of sputum spray from the patient. Also, articles soiled with his sputum must be thoroughly sterilized. Concurrent disinfection of discharges from lesions should be practiced in all types of the disease.

At the first appearance of suspected cases, the entire population should be protected by means of a vaccine, as far as practicable.

**Mortality.**—One million persons died of plague during 1907 in India alone. Thirty to 90% of bubonic, and 90% of pneumonic cases die. The "Black Death" of Europe, in the 14th century, has been the symbol of devastating epidemics for 600 years. Even today, 500,000 persons die each year of plague in India. These figures speak for themselves as to the mortality of the disease.

For the health officers of port cities the warning cannot be made too urgent, to be on the alert for plague. It is nearer to us than it has been for many years.

## 24. PNEUMONIA

The term pneumonia is generally used to cover a number of acute inflammatory processes in the lungs arising from different causes. The ones that primarily interest us here, however, are acute lobar and broncho-pneumonia produced by the pneumococcus. It has been only in recent years that this disease has been recognized as communicable and coming within the purview of the health officer by reason of that fact. Indeed, it should be a universal requirement that pneumonia cases be isolated. When we consider that about 10% of all deaths are due to this one disease alone, it looms large as a public health problem. Like influenza, pandemics of pneumonia sweep over the world at varying intervals, their appearance assuming a certain periodicity and rising to a high peak occasionally. While cases are not present in great numbers at any one time, the disease is always more or less prevalent, particularly in winter, and with its high mortality has a pronounced influence upon the death rate.

**Infective Agent.**—In 1880 Sternberg discovered the pneumococcus and published a description of it the following year, just three months after Pasteur had announced a similar finding. It was several years later, however, before the organism was recognized as being a causative agent in pneumonia. Today, we can identify four classes of pneumococci, usually designated as Types I, II, III and IV. Of the relative prevalence and virulence of these types, Rosenau has the following to say:

"*Group I* is found in about 33 per cent. of all cases of pneumonia, and has a mortality of about 25 to 30% of cases caused by it. . . .

"*Group II* is indistinguishable from Group I save by the agglutination reaction. It is found in about 33% of all cases of pneumonia, and has a mortality of about 25 to 30%. . . . A number of atypical members of this group are now classified as sub-group II.

"*Group III* is the *pneumococcus mucosus*, formerly confused with the *streptococcus mucosus*. . . . This type is the cause of about 10 to 15% of all pneumonia, and is fatal in about 50 to 60 % of cases. . . .

"*Group IV* comprises all pneumococci that do not belong to groups I, II and III. The strains in this group are not specific. . . . These organisms have a comparatively low virulence, causing about 20 % of cases. . . ."

It will be seen, then, that the more virulent types cause about 80 % of all cases.

**Immunity.**—There is a relative natural immunity to the disease which apparently, may be lowered at times by various causes, such as other pathological processes and lack of proper hygiene. Between the sixth and fifteenth years a higher relative immunity exists, while both extremes of life are especially susceptible. Unlike the majority of diseases of this sort, one attack of pneumonia seems to predispose to subsequent recurrences. It has been rather definitely demonstrated that a brief, artificial immunity to Types I and II, lasting about six months, can be produced by the use of killed suspensions of the corresponding bacteria. Such bacterins were used with favorable results in the Army.

**Modes of Transmission.**—Many healthy persons constantly harbor pneumococci of Type IV, which is least virulent, and may infect others. The other three types are usually found only in the mouths of persons who have been in recent contact with cases of corresponding types, or who are recovering from attacks of the disease. There is, therefore, a serious carrier condition constantly present in all communities, although each individual carrier retains the organisms for only a short time. Transference of the virus is accomplished by means of droplets of saliva projected into the environment of patient or carrier, as well as by hands, utensils, towels, etc., soiled with the secretions of the mouth.

**Diagnosis.**—Determination of the type of infection, by laboratory examination of the sputum, is gaining in favor with clinicians. It should be more widely practiced, as by that means the proper serum for therapeutic purposes can often be selected.

It is necessary here only to mention that pneumonia may occasionally be confused with pulmonary tuberculosis, actinomycosis, pulmonary anthrax, pneumonic plague and with invasion of the lungs by intestinal parasites.

**Methods of Control.**—The patient sick with the disease should be isolated and his sputum promptly destroyed, while articles soiled with it should be burned or disinfected. Visiting in the sick room should be discouraged by all means. Indeed it would not seem to be too rigorous to require that the house be placarded as an educational measure, in the interest of the public health. Control of the carrier is beyond the limitations of our administrative machinery, at the present time. On the other hand, no immunizing agent of universal application has been found. The health officer, then, must devote himself to inculcating principles of correct hygiene in the minds of the public. Since overcrowded living quarters are conducive to outbreaks of pneumonia, he should be particularly interested in improving the housing conditions of his community. And he should advise the repeated use of antipneumococcus vaccine in order to reduce the incidence of such cases as are amenable to this prophylactic measure.

**Mortality.**—The mortality resulting from pneumonia has already been touched upon. After the fifteenth year it rises slowly but steadily until, of persons sixty-five or over, the death rate per 100,000 is over 700. Much can be done to reduce this frightful loss by the application of immune sera, in cases produced by the first two types of the organism, and by vaccination. But in spite of every effort, pneumonia will remain a tremendous factor in our mortality statistics, for some time to come.

As a complication of some other acute infectious diseases, broncho-pneumonia is the principal cause of death. This is notably true of measles. Any steps, therefore, which reduce the prevalence of such diseases will produce a marked diminution of the pneumonia death rate. Furthermore, the health officer can do much to encourage proper care of infectious disease cases, once they have developed and thereby help to prevent the appearance of a complicating pneumonia.

## 25. POLIOMYELITIS (INFANTILE PARALYSIS)

Before influenza took foremost place upon the stage of human attention, poliomyelitis had long occupied such a position by reason of the fact that numerous outbreaks, some of them running into thousands of cases, had occurred in various parts of the country, within a comparatively short space of time. The disease struck fear to the heart of high and low alike, for none was spared, no precaution seemed to avail for its prevention, little was known of its causative agent and the resulting deformities, in those who escaped death, were pitiful in the extreme. For several years no widespread epidemic has occurred, but we have with us constantly a residue of sporadic cases which may, at any time, give rise to another devastating outbreak. The disease, therefore, deserves careful attention by sanitarians, for nothing like an adequate solution of its problem has been reached.

**Infective Agent.**—It was only in 1913 that Flexner and Noguchi demonstrated the organism of poliomyelitis in culture for the first time. Highly refined technique is required for its cultivation, as it is extremely delicate and will not grow on ordinary laboratory media. Its identity has been established by repeatedly reproducing the symptoms and pathology of poliomyelitis in monkeys by means of inoculation of cultures into the central nervous system or blood, as well as by introduction into the stomach and by swabbing on the mucous membrane of the nose and throat.

**Incubation Period.**—Extensive studies, carried on in New York, of the epidemic occurring there in 1916 indicate that the incubation period is under one week. Animal inculations do not furnish exact data on the subject. Occasionally a case develops long after exposure, the explanation for which seems to be that the victim first acquired a carrier condition from which the active case later arose, as is sometimes true for diphtheria.

**Immunity.**—Susceptibility is quite strikingly high in the age group 1 to 4 years, falling rapidly until the case incidence reaches 16.1 per 100,000 in the age group 15 to 19 years, and is practically nil at 45. Only one person in every hundred within families having a case of poliomyelitis develops a case from exposure in the household, while in scarlet fever the ratio is 1 to 10 and in diphtheria 1 to 16, probably indicating that immunity is quite general in the population. In this connection it is interesting to note one of the conclusions reached by Lavinder, Freeman and Frost in their exhaustive study of the New York epidemic, "That an epidemic of one to three recognized cases per thousand, or even less, immunizes the general population to such an extent that the epidemic declines spontaneously, due to the exhaustion or thinning out of infectable material."

**Modes of Transmission.**—Many theories have been advanced in the last few years to explain the manner by which poliomyelitis gains access to the human nervous system. The one which appeared to be supported by the greatest weight of evidence was that of transmission by the biting stable fly. Careful epidemiological investigations and laboratory experimentation have not borne out this theory. Another theory, that was held for a time, was that domestic animals or rats were the source, or the vectors, of infection. However, paralytic diseases of animals have been demonstrated to be in no wise connected with poliomyelitis and it has been impossible to transmit the disease to any animal, save the monkey, with resulting symptoms comparable to those in the human being. Furthermore, no evidence has been adduced to indicate that animals might be passive carriers of the infection.

Invariably, the virus has been found in the secretions of the nose and throat of both infected human beings and of monkeys. In the case of the latter this is true, even when the organisms are injected directly into the brain or spinal canal, or when introduced into the stomach through a tube. It would appear, therefore, that the virus is eliminated through the secretions of the upper respiratory tract. From this, it would be reasonable to suppose that the disease is acquired by droplet infection. In a few cases, monkeys have been infected by rubbing the virus on the unbroken mucous membrane of the nose and throat.

Sight must not be lost of the fact that there are more mild, unrecognized cases of the disease than of the paralytic or non-paralytic forms. Such cases, together with healthy carriers, doubtless explain the spread of infection that otherwise would often be without solution. In a small proportion of cases, infection can be traced directly to a patient sick with the disease.

**Diagnosis.**—As indicated by the foregoing, diagnosis of the mild case is of really greater importance, from the public health standpoint, than the recognition of frank cases. The latter present the usual stigmata, while the former range from a mere digestive disturbance of two or three days' duration, to more or less severe prostration and even meningeal involvement, clearing up rapidly, in a few days, without sequelae. A complete discussion of diagnosis is given by P. A. Surg. J. P. Leake in Reprint No. 431 of the Public Health Service Reports. This paper is well worth careful study. In it the author points out that, in the presence of frank cases, "the combination of fever, vomiting, constipation, drowsiness, and irritability, especially when combined with headache, a transient flushing of the face, abnormal sweating, or retention of urine, is enough to make a tentative diagnosis of poliomyelitis." It is hardly necessary to say that a careful watch should be kept for any appearance of paralytic symptoms and the affected parts be given absolute rest and support in the natural position, in order to obviate as much deformity as possible.

Lumbar puncture offers confirmatory evidence, but must be done carefully and with as little injury to the membranes of the cord as possible. "Increased pressure, with a clear, or nearly clear, fluid containing no organisms, a cell count over 10 per c.c., and increased albumin and globulin, when found, are of great diagnostic value." (Leake.)

**Methods of Control.**—The patient, whether presenting a marked case of infection or only suspicious symptoms, should be well isolated and should be protected from flies, as these may possibly act as passive carriers in occasional cases. Discharges from the nose, throat, bowels and kidneys should be thoroughly sterilized, preferably by burning or boiling. The nurse must cleanse her hands thoroughly after handling the patient or anything that has been in contact with him.

Since the carrier condition becomes quite general in an outbreak, it is manifestly impossible to control all such persons, or even to discover them. However, it is reasonable to quarantine, for two weeks from last exposure, all children who have been in contact with a case, and to forbid all adults, who are contacts, mingling in any way with minors. Where school medical inspection is available, all school children who are absent from school during an outbreak should be visited in their homes and careful observation of their symptoms maintained, in order to discover any mild cases. When medical inspection cannot be had the appearance of a case in school would warrant closing for two weeks and quarantining of all the children exposed.

**Mortality.**—As a general rule, the mortality of poliomyelitis is rather low, but in widespread outbreaks it may rise much higher. An average for practical purposes is a case fatality rate of 20 per cent. Treatment with immune serum offers the only hope we have, at present, of reducing mortality, and this is often uncertain in its action.

However, the deformities resulting from paralysis of varying degrees are an extremely serious feature of the disease, aside from mortality, for they render many victims dependent for life upon charity, or unable to gain an adequate livelihood. Every physician treating a case of poliomyelitis should familiarize himself with the advances that have been made in relieving somewhat the disabilities produced by paralysis, as well as the best methods for preventing deformity, so far as that is possible.

We should note two features of the disease that may have a lively interest for us in the near future. There appears to be a periodicity of about six years in the development of epidemics, and once started, an epidemic is more severe in rural than in urban communities. Bearing these points in mind and remembering that we always have a few cases present in every state, it is possible that we shall see an outbreak of some proportion in 1922 or 1923, or six years from the time of the last greatest prevalence of the disease, in 1916. In fact, as this is being written, in the latter part of 1922, there is a notable increase of cases in many parts of the country.

## 26. RABIES

While rabies produces only a small number of deaths, the manner of death makes it particularly terrible. Coupled with this is the fact that it is entirely preventable, which gives it especial interest to the health officer. Like anthrax, rabies is primarily prevalent among lower animals, and is acquired from them by man only through accident. All animals are susceptible in varying degrees to the infection and even birds may acquire the disease. Its geographical distribution is worldwide, with certain exceptions that will be mentioned later.

**Infective Agent.**—Noguchi claims to have grown the fine granular bodies supposed to be the infective agent, and to have produced genuine rabies with his cultures after passing them through many transfers. So far, this has been the only work that would appear to demonstrate the specific organism. It is supposed that the "Negri bodies" are the causal agent and Park and Williams believe that these bodies are protozoan in nature. Others incline to the view that they merely represent degenerative processes in the nerve cells. Whatever the facts may prove to be, it has been demonstrated that the true Negri body is specifically characteristic of rabies.

**Incubation Period.**—The incubation period of the disease varies more widely in man than in the lower animals. The latter usually develop symptoms within 6 to 21 days after infection, depending upon the activity of the virus, site of inoculation and susceptibility. In man the period depends also upon these factors, but may vary from 14 days to 7 months, both figures being the extremes. Twenty-one to 60 days may be given as the average for man, with the tendency toward the higher figure.

**Immunity.**—Only about 16 per cent. of persons bitten by demonstrably rabid animals develop the disease. However, part of this immunity is only apparent. The virus is carried in the biting animal's saliva and this may be removed, if the animal bites through the clothing, leaving not enough on the teeth to produce infection. Even so, it would appear that natural immunity does exist to a certain extent. This seems to be influenced somewhat by the location of the wound and its size.

**Modes of Transmission.**—With few exceptions, rabies is transmitted by the bite of an infected animal. In those exceptional cases, in which it develops without the victim being bitten, we find that a broken skin surface has received saliva from such an animal. Evidently the saliva of rabid animals is the vector of infection. This has been demonstrated beyond doubt by animal experimentation. Other secretions of the body, as well as many of the tissues, carry the virus, but cases of infection have never been traced to these sources.

The infective agent travels to the central nervous system by way of those nerves in the immediate vicinity of the wound. The richer the nerve supply, the sooner will infection reach the brain and cord. In the case of facial wounds, rapid extension takes place, while a bite in the lumbar region will often prove harmless.

It is an interesting fact that the bites of various animals differ in their virulence, probably due to the kind of wound inflicted. A rabid wolf produces the most serious wound, while that of the cat comes next and of the dog third. Horses and mules can produce the disease, but the form of their teeth prevents deep penetration of the tissues. It should be remembered that a rabid dog will occasionally travel great distances, before death overtakes him, and that he may thus spread infection broadcast among other animals.

**Diagnosis.**—The health officer should be informed of the diagnosis of rabies in animals, particularly the dog. Briefly, the symptoms may be given as follows:

1. *Prodromal Stage.*—The animals appear listless and sick for one or two days.

2. *Excited or Convulsive Stage.*—This is the stage which is popularly supposed to be typical of rabies. The animal's nature is changed. He may snap and bite at those with whom he has formerly been quite gentle. Or he may run about attacking every object in his way. At this time he may refuse water, not from fear of it, but because the act of swallowing produces a painful spasm of the throat. These two stages are often quite brief or apparently absent.

3. *Paralytic Stage.*—A progressive paralysis begins with the hind extremities and advances until the entire musculature is involved. Death may supervene at any time during these three stages, but is usually preceded by paralysis.

But reliance must not be placed solely upon clinical symptoms for diagnosis. When an animal has developed pronounced symptoms, it should be killed and the head sent to a reliable laboratory, *packed in ice.* Here the brain will be removed and sections or smears examined for Negri bodies. If these are not found, animal inoculations will be made as a final and practically infallible test. However, the animal must not be killed until actual symptoms have become well marked, or the laboratory tests may be difficult or a failure. Practically all dogs will show symptoms of rabies within 15 days, so that time is still given for preventive treatment after a diagnosis has been made.

In man the disease is diagnosed on the history of exposure to infection and the various stages above outlined. Rabid persons, however, do not attempt to bite others, as a rule. Neither do they "bark like a dog," mew like a cat, nor bray like a mule, depending upon the kind of animal that bites them.

**Methods of Control.**—Practically all of our rabies cases arise from the bites of rabid dogs. These animals often travel far, as was noted, while other infected animals do not. The problem of control, then, has largely to do with the proper handling of dogs.

In England the effect of a strict muzzling law, combined with a six month's quarantine of all imported dogs, has been quite striking in its reduction of rabies cases. After bringing the number of human cases down to six, in the year 1892, muzzling was relaxed, and by 1895, 37 persons had died of rabies in the three years, while the number of rabid animals found in the last year alone amounted to 672. Muzzling was again enforced and cases among men and animals dropped to zero. Norway, Sweden and Denmark have not had any rabies in 50 years, due to strict quarantine on imported dogs. By the same means, Australia has the enviable record of never having had a case.

Two years of muzzling or leashing all dogs, with the impounding of those allowed at large, would wipe out rabies entirely in the large centers.

A recent development in the prevention of rabies is the prophylactic inoculation of all dogs. Some health departments have adopted this as an alternative measure for muzzling. One to three doses of the canine vaccine are used. This method has already proved its worth in Japan and is gaining favor in this country. It seems to be logical and will relieve the health and police departments of much worry, if universally applied.

All cases occurring in animals should be reported to the health department.

As a means of preventing the disease in human beings, prophylactic treatment should be freely available. Pasteur is perhaps better known for having devised this method than for any other work he did. While it is not necessary to detail the technique of preparing and administering the virus, a brief mention may be made of it. Virus from a rabid animal is introduced into a rabbit and then transferred to a series of them until it has attained high virulence for other animals. The virus is then termed "fixed." Spinal cords from such animals are treated by one of several methods until dry and containing a stable amount of virus. These cords can be preserved for a short while, at low temperatures, and can be shipped in glycerine for use at distant points. The use of this treatment reduces the mortality to a negligible quantity, if effected in time. But the person exposed to rabies should be treated as soon as a diagnosis is made in the animal. If severe lacerations have been produced, or the animal responsible for a wound cannot be found, and a reasonable suspicion of rabies exists, immediate treatment should be instituted. While occasional complications have resulted from the treatment, such instances have been so rare that treatment should not be delayed or deferred for fear of such eventuality.

**Mortality.**—The human mortality from rabies is 100%. No further comment is needed for the thoughtful health officer.

## 27. ROCKY MOUNTAIN SPOTTED FEVER

Rocky Mountain, or tick, fever has its greatest incidence in Montana and through the northwestern region of the United States, but also extends in a milder form through Colorado into northern New Mexico. It is a disease of thickly wooded regions that tends to disappear as the timber and undergrowth are cleared.

**Infective Agent.**—The specific organism of the disease has not been isolated, although some observers believe they have succeeded in associating an amoeba-like parasite with the infection. The virus is not filterable, but is transferable in the blood of a patient sick with the disease.

**Incubation Period.**—The period of incubation is not known.

**Immunity.**—There is no natural immunity to infection, but an attack of the disease is probably protective. This is true, at least, for guinea pigs.

**Modes of Transmission.**—Ricketts definitely demonstrated that the infective agent is transferred by the bite of a tick, *dermacenter reticulatus*. It was also shown that the female tick could transmit the parasite to her young, which would then become infective for human beings. It is probable that the disease is kept alive for long periods in this manner.

**Diagnosis.**—Fever gradually rises, in one infected, much as with typhoid. By the end of the fifth day it attains a high point, which is maintained for another week, when it gradually declines in those who are to recover. On about the fifth day of the disease, an exanthem appears which many have described as like that of typhus fever. The eruption tends to confluence, with petechiae and an icteroid discoloration of the skin. Occasionally gangrene of isolated portions of the skin develops. Edema of the face and gradual increase in the pulse rate are other features. Guinea pig inoculation with blood from suspected cases will give positive results, if the disease is present, and will distinguish it from typhus.

**Methods of Control.**—The patient himself is not dangerous to those about him, but can infect ticks, if they should gain access to his bed.

Clearing and burning over of land covered with brush will serve to eradicate the tick. It is also reported, from regions where the disease has existed, that grazing sheep upon tick infested land is effective in destroying them, due to the fact that the male tick is not able to reach the female, through the sheep's wool, and there is a resulting diminution of succeeding generations. They tend thus to disappear gradually. Tick infested domestic animals should be regularly dipped.

In regions where the disease is endemic, persons going into wooded sections should protect themselves from tick bites by the use of high boots and heavy clothing.

**Mortality.**—In Montana the disease has had a mortality of 70 to 80 %. Other localities report rates as low as 2 or 3 %. It is, however, a dangerous disease and should be considered in making a differential diagnosis of eruptive fevers occurring in regions where it may be found.

## 28. SCABIES

Scabies, or the common itch, is gradually becoming more rare as the lessons of hygiene are learned and practiced more widely.

**Infective Agent.**—The animal parasite responsible for the symptoms is the *sarcoptes scabiei var. hominis.* That "the female of the species is more deadly than the male" is entirely true of scabies, for the female alone produces the lesions. The parasite burrows its way into the upper layers of the skin, depositing from 10 to 25 eggs as she advances, until she finally dies in the rete mucosum. In the course of 8 to 10 days the eggs hatch out and each new female starts a burrow of her own. This process continues indefinitely, if treatment is not had.

**Incubation Period.**—A parasite begins to burrow into the skin as soon as deposited upon it from some other source. Once eggs have been laid a period of 10 to 12 days elapses before the next generation has hatched and is capable of further reproduction. This might be considered the incubation period for further infection.

**Immunity.**—All persons appear to be susceptible to the parasite.

**Modes of Transmission.**—Any contact, direct or indirect, that will implant a living parasite upon a non-infested person can conceivably disseminate the condition. Practically, careful personal cleanliness will usually destroy any parasites thus received, before they have been able to establish themselves. However, even the most cleanly person occasionally falls a victim. Sleeping in a bed with an infested person is one of the commonest means of acquiring parasites. Constant contact within a family will also spread the disease, through other means.

**Diagnosis.**—The part most frequently chosen for initial attack by the parasite is the hand, especially between the fingers. The patient then transfers organisms to other parts of his body, usually the shoulders, legs, waistline and scrotum. Burrows on the inner side of the fingers, with excoriations of the skin, and burrows on the other parts of the body mentioned, serve to indicate the nature of the condition at once. Itching, worse at night, is always present to a marked degree. History of other persons, closely associated with the patient, who present similar symptoms, helps to confirm diagnosis.

**Methods of Control.**—An infested person should be treated as thoroughly and promptly as possible. While undergoing treatment, he should sleep alone and his bedding and underclothing should be boiled at frequent intervals to kill the parasites. Children bearing the infestation should be excluded from school until free from the organisms. Visiting nurses can do much to eradicate such conditions by educating their charges in hygiene and sanitation.

**Mortality.**—There is no mortality from scabies.

## 29. SCARLET FEVER

Because of the multiplicity of its possible complications and sequelae, as well as the frequent severity of the disease itself, scarlet fever has always been one of the most dreaded diseases of childhood. Aside from a mortality ranging between 4 per cent. and 30 per cent , it often leaves in its wake lifelong disablement of greater or less severity. For many years, the tendency has prevailed to reserve the term "scarlet fever" for those cases which are well marked, while "scarlatina" has been applied to the more mild forms. This is an error that should be corrected, for the two terms are exactly synonymous, the former being the English form of the Latin "febris scarlatina."

**Infective Agent.**—A great mass of research work has been done to determine the causative agent of scarlet fever, but success has not yet been achieved. That it is a microorganism cannot be doubted, for the disease behaves in all respects as do those of a definite microbial origin. However, nearly all cases present a severe streptococcus invasion of all parts of the body, to which the grave symptoms and dangerous complications are usually due. Many experiments have demonstrated the infective virus in the secretions of the nose and throat, in material from the tonsils and in the exudates of various lesions. Its infectivity increases to some extent, during the development of the exanthem, and may persist in some patients well through convalescence, or even after apparently complete recovery. This complicates the problem of control to some extent.

**Incubation Period.**—Incubation is comparatively brief, usually being given as from one to seven days. In experimental inoculations it was rather constantly three to four days in duration.

**Immunity.**—Very young infants are generally immune. From then until the age of about ten, children are quite susceptible, but not to the extent noted in measles, smallpox and chickenpox. As age advances susceptibility decreases proportionately. However, immunity to the disease is variable in the individual, for a child may escape infection at one time only to succumb at another. One attack usually protects for life.

Some work has been done with streptococcus vaccine that would warrant further investigation of this agent as a prophylactic. A few observers have also noted an apparent immunity conferred by diphtheria toxin-antitoxin.

**Modes of Transmission.**—Experimental inoculation of the secretions from the nose and throat has produced the disease. It is evident, then, that the saliva is infective both as droplets in expired air and when freshly deposited upon various articles. Exudates from the lesions have also been shown to be a source of infection. The former is usually most infective at the height of the exanthem, while the latter may retain the virus for an indefinite period.

Scarlet fever is constantly prevalent in larger communities, but develops sporadically in smaller ones. Often it is quite difficult or impossible to trace the origin of an outbreak. It is possible that carriers exist to a certain extent at all times, but it is probable that the many mild cases, some presenting practically no symptoms, contribute most largely to the dissemination of the disease. Where strenuous efforts have been made to detect and isolate these atypical, or "missed," cases epidemics have subsided with surprising abruptness.

Milk-borne outbreaks of scarlet fever are rather frequent, traceable, without difficulty as a rule, to some person engaged in the preparation or sale of the milk. These outbreaks are usually explosive in character and may be of considerable extent. One such was found to originate with a milker who had a suppurating lesion of the finger, following an attack of scarlet fever.

That the desquamated epithelium of a case is capable of propagating the disease has long been taught, until it has become thoroughly interwoven with sanitary practice. We know now, however, that such is not a fact, for repeated attempts to reproduce scarlet fever with the scales have failed entirely. Modern sanitary practice ignores the scales in determining the period of isolation for the patient.

**Diagnosis.**—The symptomatology of scarlet fever is quite familiar to all physicians and the frank case is not likely to be erroneously diagnosed. There are, on the other hand, many mild cases of the disease that are called by almost any name but the correct one. "Stomach rash" is an old favorite of this class. Much of this confusion could be saved by (1) the taking of a careful history in which would usually be found an exposure to some other child with a similar condition; by (2) noting more or less severe prodromal symptoms developing *suddenly;* by (3) a thorough examination of the entire body of the patient for the presence of the typical rash and sore throat, and, (4) later, by observing desquamation, which may vary from a fine, branny scale to great patches of integument. Another point of value to those who have access to a microscope is the fact that there is more or less leucocytosis in this disease as contrasted with measles or German measles, in which an opposite condition of the blood prevails.

Occasionally a case of scarlet fever is diagnosed as diphtheria, from a heavy deposition of exudate in the throat. Such an error could hardly occur if a complete examination of the patient's body were made. In such cases there is also a more profound prostration than is found in the early stages of diphtheria.

Another disease, not commonly seen, that resembles scarlet fever quite closely, is the so-called scarlatiniform erythema. The two are identical in many respects, but the latter condition does not present the marked systemic disturbance that would be expected in a case of scarlet fever exhibiting an equal amount of rash. This form of erythema is also characterized by regular, periodic recurrences, often for a period of many years.

As a general rule, and certainly if scarlet fever is present in the community, any case presenting a history of sore throat, with fever, possibly vomiting, and a diffuse rash, should be suspected of being scarlet fever, no matter how mild these symptoms, and a provisional isolation should be maintained. It is best to err on the side of safety to the public. Many epidemics have been caused by neglect of this important principle.

**Methods of Control.**—The patient should be isolated promptly and held in isolation as long as there is a pathologic discharge from any body cavity, or an exudate from any lesion. Concurrent disinfection must be practiced rigorously, as practically all secretions and exudates are infective, so far as we know. The nurse must cleanse her hands thoroughly, after handling the patient or articles that the patient has recently used.

Since the incubation period is short, it is necessary to quarantine contacts for only seven days from date of last exposure. This restriction applies to children and to adults whose occupations bring them into contact with children.

When an outbreak of scarlet fever occurs in a community, all school children should be examined every morning, during its continuance, and any child with even slightly suspicious symptoms should be promptly excluded. If competent inspection is not obtainable, it would be better to close schools, for one week, in small communities, requiring the teacher to examine all children carefully for signs of sore throat, rash or desquamation, upon their return, and to send those presenting such conditions to the health officer for further investigation. Absentees, upon re-opening, should be carefully investigated.

It is hardly necessary to say that no one who has the disease, or who is convalescing from it, or who is nursing a case of it, should be permitted to handle milk or other foods intended for public distribution.

The health officer should make an energetic search for the source of an outbreak of scarlet fever, always bearing in mind the two factors of mild, missed cases and of an infected milk supply. He should also educate the teachers within his jurisdiction to a recognition of the early, suspicious symptoms, such as feverishness, sore throat, vomiting and the general catarrhal manifestations.

**Mortality.**—Outbreaks of scarlet fever vary considerably in their virulence. The milder forms have no mortality, while others run as high as 30% of all cases. The disease is predominantly a streptococcal infection, with all of the complications and sequelae characteristic of such a process.

Almost any part of the body may suffer from a secondary invasion by the streptococcus and, often, with rapidly fatal results. The kidneys invariably show a greater or less degree of injury and the complicating nephritis is one of the principal causes of death. Every physician in attendance upon even the mildest cases of scarlet fever should insist upon absolute rest in bed for at least two weeks, as a safeguard against this eventuality. Furthermore, parents should be educated to protect their children from exposure to others presenting catarrhal symptoms or other signs of illness. Until we know definitely the causal agent and the methods of its control, no rational means of avoiding exposure should be overlooked.

## 30. SEPTIC SORE THROAT

In septic sore throat we have succeeded in separating out a distinct disease entity from the great mass of streptococcal infections, of which we know very little. Erysipelas, puerperal septicemia, certain forms of pneumonia and some cases of cellulitis are among the other principal infections of this class. Little was known of epidemic streptococcus sore throat until very recent years, when it was studied at the time of severe outbreaks in Boston, Baltimore, Michigan towns and a few other localities. These investigations demonstrated the fact that this was a throat affection having a specific origin and symptomatology readily distinguished from either diphtheria or ordinary tonsilitis.

**Infective Agent.**—"Streptococcus" is the family name for a large group of organisms that look alike under the microscope, but which may be divided into at least three fairly well defined classes on the basis of their hemolysing properties. It is to one of these alone that most of the severe infections, such as the disease we are discussing, are due. This coccus has hemolysing powers and produces a profound intoxication, to which most of the serious manifestations of the disease may be ascribed.

**Incubation Period.**—Little is known of the time required for incubation, but it is thought to be quite brief, in fact, only a day or two.

**Immunity.**—Much confusion exists upon the question of immunity to streptococcal invasion. On the one hand, persons who have had attacks of erysipelas seem to be more susceptible to recurrences and there is a report of this disease having been produced ten times in one individual by inoculations for the relief of inoperable cancer. On the other hand, quite encouraging reports have been made upon the use of immune sera for the treatment of streptococcal infections and upon prophylactic vaccination. Until our knowledge of the various strains of the coccus is more definite, little can be expected in the way of artificial immunization.

**Modes of Infection.**—In the disease under consideration the infection is primarily one of the throat and the organisms are found there in enormous numbers. That they should be transferred in the secretions of the mouth seems obvious. Sputum spray, articles soiled with saliva, the hands of the sick, of carriers and of the nurse, and all direct or indirect contact should be suspected.

We do know, however, that the common mode of spread in epidemic outbreaks is through contaminated milk. This has been demonstrated by careful epidemiological studies of the outbreaks mentioned in the introduction to this section. Simon, in his work on Human Infection Carriers, says that every such outbreak has been traced to a milk supply. But, with the exception of one case, it has not been possible to identify the person responsible. A carrier has been suspected and, indeed, persons suffering with the infection have been found upon the dairies involved, but whether they were the primary source, or victims of the hypothetical carrier, could not be demonstrated. It was at first supposed that garget in the cow was responsible for the disease in man. This has now been demonstrated to be not the case at all, since the bovine streptococcus is practically inocuous to man, as likewise the human form for the cow. But it has been shown experimentally that the human type of the organism does invade the cow's udder and there proliferate, without producing any apparent inflammatory process.[1] It is, therefore, conceivable that a cow so infected by the hands of the milker might spread disease for a considerable period. And it is a fact that outbreaks of the sore throat have persisted over many weeks, in some instances. To complete the evidence against the milk, streptococci indentical with those of the disease prevailing have been found in milk supplied to those who were infected.

In the population at large, persons are found in great numbers who harbor streptococci in their throats, either intermittently or continuously. Some of the cocci so found are of the more virulent type. This would suggest a carrier condition more or less constantly present.

**Diagnosis.**—The outstanding feature of septic sore throat is the profound prostration produced at the very outset of the attack. This should serve to warn the physician of an extremely toxic invasion and aid in distinguishing it from diphtheria. In both diseases we see a pseudomembrane on the throat which has no distinguishing marks in either case. But the toxemia appearing at the commencement of symptoms is suggestive. A throat swab should always be taken and cultured. A direct

[1] An exception to this has recently been noted. See Jour. Am. Med. Ass'n. for June 16,1923.

smear from the swab will usually reveal the streptococci in great numbers, sometimes in apparently pure culture. Implanted upon Loeffler's blood serum medium, the organisms can be distinguished by growth and by stained smears in twelve hours. The laboratory test is useful in distinguishing streptococcic throat infections from diphtheria. Care should be exercised to differentiate septic sore throat from tonsilitis and from scarlet fever.

**Methods of Control.**—The patient must be isolated and the discharge from his mouth and nose destroyed. Articles soiled with these discharges must be well disinfected.

The nurse should observe scrupulous cleanliness of the hands at all times.

Until we know more of the modes of transmission and the nature of the infective agent, little can be done to control contacts upon a rational basis.

At the first appearance of several cases, the health officer should look carefully into the milk supply. If a large proportion of the patients receive their milk from a common source, this should at once be suspected. In view of what we already know, it would be reasonable to insist upon pasteurization of this milk before it is allowed on the market. The throats of all persons who are connected with its production and sale should be cultured repeatedly and those who show a marked streptococcal flora should be excluded from the dairy. In some cases, it would be practicable to examine the milk of each separate cow bacteriologically in order to discover whether a cow is the source of infection.

Finally, it would do no harm to offer prophylactic vaccination with a good, polyvalent vaccine, to all who desire it.

**Mortality.**—The percentage of cases which terminate fatally is not high, running to about four per cent. in the more virulent outbreaks. There is a secondary death rate, however, which swells this figure; how much, we do not know. Complications and sequelae may be severe and such affections as endocarditis and nephritis are not at all uncommon. The disease is sufficiently debilitating and its complications dangerous enough to warrant every effort being made to control it.

## 31. SMALLPOX

One hundred and fourteen years ago, Thomas Jefferson wrote to Jenner, the originator of smallpox vaccination as practiced today, "future nations will know by history only that the loathsome smallpox has existed and by you has been extirpated." In the two years just passed, an alarming increase of smallpox has been noted in many parts of the country. Recently, outbreaks of the most malignant form have appeared in several communities. It is a growing menace to our people. That such should be the case is all the more deplorable when we consider that it is the most easily controlled of the whole group of transmissible diseases. Nor is smallpox always the benign affection to which we have become accustomed in recent years, as evidenced by the fact that a careful estimate attributes to this disease alone 60,000,000 deaths, during the eighteenth century. Three and a half million lives are said to have been sacrificed to it in a short period after the Spanish invasion of Mexico. And within twenty-five years this country has seen circumscribed outbreaks of high mortality. The mild form prevalent today made its appearance in the southern part of the United States about 1896. Because of its supposed origin in that island, it was called "Cuban Itch" and this term is sometimes applied to it even yet. It was also given the name "varioloid," which is quite indifferently used, but, according to the best usage, this term should be reserved for those vaccinated cases which run an atypical course. The fact should not be forgotten that both varioloid and the less virulent type of smallpox are one and the same with true smallpox, or "variola vera," and capable of producing serious cases in the unvaccinated. For a masterly description of the disease, deserving a place among medical classics, the reader is urged to study carefully Schamberg's description in his textbook on "Diseases of the Skin and Eruptive Fevers."

**Infective Agent.**—Considering our fund of knowledge relating to smallpox, it is quite remarkable that the specific organism causing it has never been identified. Of late, some work has been done that rather points to a protozoon as the infective agent.

**Incubation Period.**—Eight to 14 days will cover the incubation period of typical smallpox, or "variola vera," while it sometimes extends to 21 days in the mild type.

**Immunity.**—All persons in all age periods are exquisitely susceptible. One attack usually protects for life, but there are recorded cases of one to four recurrences.

VACCINATION WITH COWPOX VIRUS WILL CONFER IMMUNITY FOR A CONSIDERABLE PERIOD. Our general freedom from violent and fatal outbreaks of the disease is due to this fact alone. Two successful vaccinations will confer immunity for life, upon the majority of persons. An attack of the disease in a person so vaccinated, if it occurs at all, will be of the mildest form.

The word "successful" is used advisedly, for many attempts at vaccination are not successful, although they may appear to be so to the uninformed. The proper procedure in vaccinating and the resulting reaction are described in the following outline form.

### METHODS OF VACCINATING

1. Be sure that the virus is *fresh.* It deteriorates rapidly at ordinary room temperature and, for that reason, should be kept in the ice box. Stocks should be frequently renewed.

2. Select a convenient place upon the subject's body, preferably on the left arm or just below the scapula on the back, or on the thigh.

3. Cleanse the skin thoroughly and dry with alcohol or ether, if desired. *Do not use antiseptics,* as they will destroy the virus.

4. Place two or three drops of the virus upon points on the skin about one inch apart. Multiple applications of vaccine produce a much higher percentage of "takes" than does one alone.

5. Pass a needle through the flame of a match, or alcohol lamp, and prick the skin lightly, through the drops of virus, making about twelve punctures in each drop, but not drawing blood. This procedure may be varied, if one wishes, by first making one or two small scratches on the skin and then rubbing in a drop of virus on each scratch. Some prefer to use the point of a bistoury, or scalpel, instead of the needle, but the latter is more convenient because of the ease of sterilization. *THE SMALLER THE AREA OF INOCULATION, THE LESS CHANCE THERE IS OF INFECTION, SORE ARMS OR DISFIGURING SCARS.*

6. *Do not put any dressing over the vaccination.* Its application only does harm by favoring the growth of bacteria. A square of clean gauze may be pinned to the inside of the sleeve to prevent sticking. This warning applies to the entire course of the eruption. If the site of inoculation is not more than four millimeters in diameter,

the vaccination will develop a distinct, circumscribed pustule, with a firm pellicle, which is tough and not easily broken.

A very successful method of scarification, which is the most rapid of all, especially in vaccinating schools or other large groups, is to use a small chisel, similar to a No. 4 dental chisel, with a 4 mm. blade. This may be sterilized in a flame, and the scarification made by rotating the chisel on the skin. Only the epidermis should be removed, enough to expose the derma, but not enough to draw blood.

The resulting scar of vaccination is quite characteristic. It is at first red, gradually fading to white. The *surface is pitted* with many fine indentations, which should be distinguished from the seams and ridges resulting from the ulcerations which may be present if secondary infection has extensively invaded the area.

If the subject has been previously vaccinated, and still maintains a partial immunity, the course of a second vaccination may be somewhat *accelerated*, the whole occurring within a period of eight or nine days, with less systemic reaction, and with a very slight resulting scar. Such a partial vaccination is termed a "vaccinoid." Again, a second vaccination done within a comparatively brief period after a previous vaccinia, or in persons with a well-developed immunity, usually presents an *immediate*, or "immunity" reaction, with papulation on the first or second day, a distinct areola, and a prompt subsidence, without passing through the other typical stages. Both the vaccinoid and the immunity reaction, if definitely observed, should be considered to be successful vaccinations.

In closing the discussion of vaccination, a word should be said as to the alleged dangers of the procedure. Undoubtedly, in times past, when virus fresh from a case, or from an animal, was used, without the care in preparation given it today, some untoward complications developed. However, accidents due to infected virus are practically unknown at present, since all virus is carefully controlled by the U. S. Public Health Service, before being placed upon the market. The writers have, bewteen them, personally performed or supervised over 25,000 vaccinations and have never seen a complication more serious than a sore arm of a few days' duration. During the past few years, many stories of amputations, etc., necessitated by vaccination, have been traced to the original subjects of the various tales and, in every case, these rumors were found to be absolutely untrue. Experience has shown that practically all the unpleasant occurrences in vaccination may be avoided, if the following three simple rules are observed:

1. Make the area of scarification as SMALL AS POSSIBLE.
2. Do not use any shield, nor any dressing that will prevent free access of air to the vaccination.
3. Handle the vaccination with scrupulous cleanliness.

**Modes of Transmission.**—Personal contact is undoubtedly the principal factor in the spread of smallpox. Often, in the mild type, as the eruption appears, the patient feels well enough to get up and be about and so has the opportunity to spread infection widely. Occasionally, the prodromal symptoms are so mild as to permit the patient to be about until the rash appears, thus exposing many to infection.

There can be no question, also, of the infectivity of the products of inflammation in the skin, which appear to carry the unidentified virus. The exudate, either moist or dry, is infective for quite a period, as are also the scabs. Articles soiled with the discharge and with secretions of the mouth could transfer infection to others, and it could be carried on the feet and proboscis of a fly. It has been demonstrated that "air borne" infection, as commonly interpreted, has no part in the spread of the disease. The *case* in an *early* stage, coming into contact with unvaccinated persons, is the principal factor in the dissemination of smallpox.

**Diagnosis.**—Because of the frequency with which chickenpox and smallpox are confused, it is important that the health officer be well grounded in their differential features. There is no single pathognomonic sign to be found in every case, but a diagnosis must be based upon a number of details. Those listed below may all be present to a marked degree, or they may be modified more or less, or some of them will be lacking entirely. But enough will be presented by every case to make a definite determination possible, when the picture is studied in its entirety.

1. The prodromal symptoms are usually severe, especially the headache, pain in the back and fever. They may be out of all proportion to the ensuing eruption. These symptoms continue for three days, at least. Following this there is a distinct remission of the prodrome just prior to commencement of the eruption.

2. On the fourth or fifth day from the commencement of symptoms, the eruption makes its appearance on the face and wrists as a macule, developing in twenty four hours into a papule with a hard, "shotty" feel to it. There is a continuing formation of new lesions, for a day, upon the parts first attacked. Meanwhile other portions of the body are undergoing the same process, but with the lesions a little behind the eruption at the site of first appearance. A point of particular significance is the fact that the EXPOSED parts of the body, together with the legs and feet, present by far the greatest number of lesions. This is the opposite condition to that found in chickenpox, where the TRUNK and face are more markedly affected than the forearms or lower portions of the legs. To observe the distribution of

the eruption, it is urged that the whole body be seen at one time. In doubtful cases, the number of lesions in equal areas of skin, on different principal parts of the body, should be counted. A rather characteristic feature of smallpox is the appearance of a varied amount of eruption in the palms of the hands and the soles of the feet. Because of the thick epidermis these lesions do not develop in the usual manner and they persist for a long period after all others have healed, leaving a dark, mahogany-red spot which is definitely diagnostic. It should also be noted that in any given area of the skin all of the lesions are of practically the *same age*, while those of chickenpox may be of *all ages*, from macule to scab.

3. True umbilication is seen only in smallpox. It is a depression of irregular shape in the center of the vesicle and is not due to partial collapse of the vesicle, as may be observed in chickenpox.

4. The covering of the vesicle is tough and cannot be ruptured easily with the finger nail, while that of chickenpox has a frail, easily broken surface.

5. A feature of considerable significance in smallpox is the duration of the eruptive stage. From the appearance of the macule to the commencement of desiccation, a period of at least eleven days intervenes.

6. When all signs fail, a final resort may be had to vaccination of the patient as a test. If there is an *immunity* reaction the presence of smallpox may be safely assumed, unless the person has recently been vaccinated.

To sum up, then, observe the following principal diagnostic points:

1. A rather severe prodromal period.

2. A distinct remission in these symptoms, just prior to the appearance of the rash.

3. Distribution of the rash. "The broad features of distribution are that the rash prefers the upper half of the

body to the lower, that it is a rash of the face and arms rather than of the trunk and legs, that it is a rash of the distal ends of the limbs rather than of the proximal, of the back of the trunk rather than of the front, of the extensor surfaces rather than of the flexor, and that it is a rash which shuns the most pronounced flexures." (Ricketts & Byle.)

4. Lesions in the same stage on any given area of skin.

**Methods of Control.**—Smallpox is the most easily controlled of the acute infectious diseases and the foremost method is contained in one word—VACCINATE! A vaccinated population need have no fear of smallpox, nor endure a tedious and expensive period of quarantine. Vaccinate every school child upon entering the primary grade, again in five years, and finally in high school. Vaccinate every person who may have come even remotely into contact with a case of smallpox. In a generation the disease will have become a curiosity in a community so protected. This is no idle theory, but has been demonstrated on a national scale in Germany, for many years. There are advanced communities in the United States that have not seen a case in five years. We have frequently observed that schools in which the children were fully protected by vaccination have continued to operate, without interruption, while smallpox was extensively prevalent in the community, and not a case has developed among the children *successfully* vaccinated. Note, however, that the vaccination must really be a successful "take" and not a perfunctory scratch on the arm.

It is surely reasonable to allow absolute freedom of movement to any person, recently in contact with smallpox, who will submit to successful vaccination. Aside from the nurse, there need be no restriction placed upon other members of a household wherein smallpox exists, provided this precaution is observed and the patient is well isolated. And even a nurse, who has been well protected by vaccination and who takes the necessary precautions as to personal cleanliness, need not be confined to the premises.

Isolation and concurrent disinfection of the most rigorous sort must be practiced in the case of a patient sick with smallpox. Secretions of the mouth and nose, exudates from the lesions, and scabs that have been cast off, are all infective. They must be destroyed at once and completely, by burning, if practicable, or by boiling and the use of antiseptics. In this connection it should be noted that phenol preparations, in the strength ordinarily used, *do not* exert a destructive action upon the virus. Boiling water should be the disinfectant of choice wherever at all applicable. Screening of the patient against flies is also of considerable importance.

Those who have come into contact with smallpox must be quarantined until successfully vaccinated, or, refusing that, for a period of 15 to 21 days.

**Mortality.**—The disease has been extremely fatal, in times past, and there is every reason to believe that this type of infection may make its appearance again. In fact, several outbreaks of extremely fatal smallpox occurred during the winter of 1921–22, in some of the western and mid-western states. The mortality ran as high as one out of every three cases, in a few communities. While the present mild type of smallpox has practically no mortality, it occasionally gives rise to a fatal case. Rosenau gives the case fatality of this type as 0.5 per cent.

## 32. TAPEWORM INFESTATIONS

A number of tapeworms are found in nature which more or less frequently infest man. The most important of these are the species derived from hogs, cattle, fish and dogs.

**Infective Agents.**—The pork tapeworm is *Taenia solium*, the adult being found in man, and the larval form, known as *Cystercercus cellulosae*, being found in pork (commonly called "Pork measle"). The beef tapeworm is *Taenia saginata*, the larval form being found in cattle, and termed *Cystercercus bovis* (commonly called the beef "measle"). From dogs we have *Taenia echinococcus*, the larval form of which is found in man, and is known as an echinococcus, or hydatid cyst. Occasionally infestations with another dog tapeworm, the *Dipylidium caninum*, are reported. The most frequent tapeworm found in man is a small form known as *Hymenolepsis nana*.

There are two types of tapeworm infestation in man; that with the adult worm, which occurs in the intestinal tract, and that with the larval form, which may occur in various body organs in the form of cysts. The adult worms are flattened, elongated, segmented worms, the different species of which may vary in length from a few millimeters to several feet. The mature segments are bisexual, and discharge large numbers of eggs, which develop into the larval cysts when ingested by suitable hosts.

**Incubation Period.**—The periods of incubation of the diseases due to tapeworms are indefinite, and depend partly on the time required for the development of the parasite, and partly upon the extent and locus of infestation.

**Immunity.**—There is no known natural immunity to tapeworm disease.

**Modes of Transmission.**—Larval cysts of the pork, beef and fish tapeworm are ingested by man when uncooked, or incompletely cooked, flesh of such infested animals is eaten. Larvae or eggs of dog tapeworms may be received by direct contact with the animal.

**Diagnosis.**—Parasites infesting the intestinal tract throw off segments and eggs in the stools. Macroscopic and microscopic examination of the latter will disclose the kind of worm present. Cystercercus and echinococcus diseases are often difficult to diagnose, and may be confused with abscesses of the organ or region affected. Often an increased eosinophilia is suggestive. Their final diagnosis usually depends upon finding the larval cyst in the lesion.

**Methods of Control.**—Thorough cooking of meats and fish will destroy the larval forms of several of the species infesting man. It should be noted that large pieces of meat may require as much as an hour to become heated throughout. The offal accumulating at abbatoirs should not be fed to hogs or dogs without thorough cooking. Pet dogs should be treated to rid them of intestinal parasites.

**Mortality.**—Rarely does a tapeworm (adult) kill by its presence alone. Occasionally children may suffer from intestinal obstruction due to this cause. On the other hand, farval cyst infestation of a vital organ may be quickly latal. Intestinal parasites all produce more or less debility and secondary anaemia, which renders the victim more liable to serious results from other infections.

## 33. TETANUS

While not a communicable disease, in the usual sense of that term, tetanus has a public health significance as a cause of mortality that is largely preventable. During the late war, it assumed considerable importance and its prophylaxis was given especial attention.

**Infective Agent.**—*B. tetani* is found almost universally in soil that has been mixed with manure of horses and cattle. It is a spore forming organism and for this reason can persist for a long period of time under conditions that would be fatal to other forms of bacteria. The spores resist drying, but not direct sunlight. Symptoms in tetanus are the result of the powerful toxin formed by *B. tetani*. It is of interest to note that the bacillus is found in the intestinal tracts of animals and that this fact may account for its occasional presence in surgical "catgut."

**Incubation Period.**—As a rule, symptoms of tetanus develop in the second week after infection. Longer and shorter periods are sometimes noted. The infection may lie dormant for months in the scar of a wound, only to light up under the disturbing influence of an operation.

**Immunity.**—Natural immunity in man appears to be absent. Artificial immunity can be induced by the use of antitoxin. Five hundred to 1500 units are usually given for this purpose. Its routine administration to all wounded, during the war, proved a life saving procedure, when results were compared with those of former wars.

**Modes of Transmission.**—Tetanus is invariably acquired through the introduction into the body of material carrying the bacilli or spores. Usually garden soil or street dust are the vectors of infection, finding their way into the deeper portions of a wound on the object that inflicts it. Improperly sterilized dressings and ligatures have carried the infection. Babies occasionally die of tetanus from the use of dirty materials for tying the cord. In Cuba this was a frequent cause of infant mortality until an enlightened government supplied the midwives with sterile ligatures.

Occasionally, we find a case of tetanus that offers no evidence of its source. From our knowledge of the disease and from experimental work, we know that it cannot enter through unbroken skin. It is likely, therefore, that such cases are really the result of minute injuries or of invasion from the intestinal tract.

**Diagnosis.**—Masseter spasm, followed by stiffness of the neck and later by convulsive seizures, are the cardinal symptoms of tetanus. In the early stages, a patient's blood serum bearing the toxin will produce tetanus in a mouse. Cultures from wound exudates and their inoculation into animals will also confirm diagnosis.

**Methods of Control.**—One method of control is alone available—the early use of antitoxin. In every case presenting a wound that has been soiled by earth, or manure, antitoxin should be given *at once* and repeated at weekly intervals until healing is completed. Midwives must be taught to use sterile ligatures in tying umbilical cords. Toy cap pistols of the old style, a frequent source of tetanus infection, should be prohibited. If any operative procedure is to be instituted in the presence of a healed wound that might have received *B. tetani*, antitoxin administration should precede operation.

Excepting the exudate of his wound, a patient suffering with tetanus is not dangerous to his attendants and no precautions are necessary, save the proper disposal of dressings.

**Mortality.**—Untreated tetanus produces a mortality of about 75 per cent. This varies inversely with the length of incubation period and directly with the abundance of nerve fibres about the wound.

Prophylactic serum has reduced mortality to the vanishing point. Where symptoms have developed, it has also doubled the percentage of recoveries, when used therapeutically.

We may say that mortality in tetanus, as in diphtheria, depends upon the *early* use of sufficient antitoxin.

## 34. TRACHOMA

"The protection of the citizen from the assaults of ignorance, indifference, or neglect, when they threaten his well-being and even his economic efficiency, is a duty which the state cannot evade and which he has a right to exact." Thus is formulated the principle upon which is based every activity of the health officer that has to do with the conservation of human comfort and efficiency rather than the preservation of life. Those infections, therefore, which are likely to produce partial or total blindness offer a fruitful field of such activity and with one of them the present section deals.

Trachoma is as old as recorded history, but it is only in modern times that its contagiousness has been recognized and intelligent efforts made to control its spread. No immigrant is allowed to enter this country if he presents evidence of being infected with the disease. Many states have laws or regulations looking to its control. But before such measures were adopted, the disease gained a foothold and has remained endemic, for years, in some of our more remote communities.

**Infective Agent.**—The specific organism still remains unidentified, but that it exists cannot be doubted from the fact that the disease spreads slowly through a family or a group of persons who are closely associated. We do know, however, that the virus can be killed by heating for three minutes to 50 degrees C.

**Incubation Period.**—The period required for incubation is unknown.

**Immunity.**—Apparently, all persons, of all ages, are susceptible to infection.

**Modes of Transmission.**—The discharge from infected eyes is contagious and can be transferred on the fingers, as well as by those articles that may become soiled with it, such as towels, wash basins, handkerchiefs, spectacles, etc. The common towel has been regarded as the chief offender in this respect, by those who have studied the disease in localities where it prevails.

**Diagnosis.**—The patient usually notices first a smarting of the eye, as if some particle of foreign matter had gotten under the lid, and he generally ascribes all subsequent symptoms to some such cause. Very slowly the disease takes root in the membrane lining the lids, producing hard, shining, translucent, yellowish elevations that are about the size of an ordinary pin head. During this process pus exudes, gluing the eyelids together in the morning, and there is much inflammation of the entire conjunctiva, with lacrymation and photophobia, in the majority of cases. Constant irritation of the eyeball from the granulation usually produces corneal ulceration, which is the immediate cause of visual impairment. Remissions or intermissions are quite characteristic of the infection. The inflammatory process sometimes throws the membrane lining of the eyelid into folds which may be so extensive as to obscure the granules. But the latter can always be found in the fold of membrane at the point where it meets the eyeball. Diagnosis rests upon a history of gradual development, with remissions, and upon the characteristic appearance.

**Methods of Control.**—Control depends primarily upon proper hygiene, such as the avoidance of towels and like articles that are used in common, coupled with scrupulous cleanliness of the hands when in contact with the disease.

Children suffering with the infection should be removed from school, if in the acute stage, and should not be allowed to attend at any time unless receiving constant and adequate treatment. Intelligent adults should be instructed as to the dangers of the disease to themselves and others. Those who are wilfully careless might well be isolated, if presenting acute symptoms.

Common towels and other such articles as may convey the fresh virus should be absolutely banished from any civilized community.

Where the disease has become prevalent in a community, free clinics for treatment should be maintained by public funds, both for the sake of the patient and the protection of the well. This is particularly necessary in the poorer districts because of the tedious course of treatment required to produce even an arrest of the disease.

**Mortality.**—There is no mortality from trachoma.

## 35. TRICHINOSIS

Trichinosis is a parasitic disease common to man, smaller carnivorous domestic animals, and rats. The usual cycle is from rat to hog to rat, but the cycle may be completed in either hog or rat.

**Infective Agent.**—The adult worm, *Trichinella spiralis*, inhabits the intestinal canal of the host, and the female discharges embryos into the intestinal lumen. The embryos penetrate the mucous membrane of the intestines and thereby enter the blood stream, by which they are carried to all parts of the body. The embryos develop into larval worms which, after migrations through the muscles and tissues, become encysted in the striated muscles. During migration they produce acute symptoms of trichinosis disease.

**Incubation Period.**—Symptoms of the disease appear in from ten to twenty days after ingestion of infected meat.

**Immunity.**—No natural immunity to *Trichinella spiralis* is known.

**Modes of Transmission.**—Eating raw or incompletely cooked pork is the chief mode of transmission of *Trichinella spiralis*. The hog usually acquires its infestation from eating offal, or rats, about slaughterhouses. Rats become infested from eating offal, or each other. A double or triple cycle of hog to hog, rat to rat, or rat to hog to rat, occurs about insanitary slaughterhouses. Infection in man is more or less accidental and secondary to the other primary cycles.

**Diagnosis.**—There are two stages to the clinical manifestations of trichinosis. The first coincides with the intestinal invasion and development of the worm, and is ordinarily characterized by pain and diarrhea. Secondly, general systemic invasion by the embryos gives rise to severe symptoms marked chiefly by violent muscular pains, local edema, and a considerable increase in eosinophile count. Slight infestations may give mild symptoms. If trichinosis is suspected, definite diagnosis may be established by excising a small section of muscle (usually the deltoid), and examining a thin section under the low power of the microscope. At the onset of the symptoms blood may be taken in 3 per cent. acetic acid, centrifuged, and examined for embryos. Embryos and dead males may be recognized in the stools during the initial intestinal symptoms.

**Methods of Control.**—Thorough cooking of all pork and sausage will protect man from invasion by *Trichinella spiralis*. Hogs should never be fed uncooked slaughterhouse offal. Rats about slaughterhouses should be exterminated. Storage of pork and pork products at a temperature of 5 degrees Farenheit for twenty days or longer will kill all encysted larvae. This is probably the best protection available, as it avoids the possible ill effects of poorly cooked meat.

**Mortality.**—The case fatality of trichinosis is about half that of typhoid fever, but may rise higher in some outbreaks. It would appear from dissecting room studies that from 1 to 2 per cent. bear evidence of having suffered from trichinosis at some time in life.

## 36. TUBERCULOSIS

Long before Koch announced his discovery of the tubercle bacillus, tuberculosis had engaged the attention of many sanitarians as a problem of the first magnitude. That it still maintains its rank is evident on every side. Autopsies done on 195 children, dying of various causes between the ages of 2 and 10 years, revealed the presence of tubercle bacilli, living or dead, in 60 per cent. Rosenau says, "The toll falls heaviest during the period of life of greatest usefulness—thus 30 per cent. of all deaths between the years of 15 and 60 are due to pulmonary tuberculosis alone. Naegli, from a careful examination of a large number of bodies in Zurich, found evidence of tuberculosis in over 90 per cent." Such figures merely serve to show that infection is well nigh universal and that the death rate is extremely high.

Like syphilis, tuberculosis attacks practically every structure of the body; but, unlike the former, it spares the mental faculties, except as these may be injured by a meningitis. However, 70 per cent. of all tuberculosis is pulmonary.

We must draw a distinction between infection with tuberculosis and the developed disease itself. As was said in the beginning, infection is nearly universal; but not all who are infected develop recognizable symptoms. Thus the duty of the health officer is twofold; to prevent infection as far as possible, and to reduce the incidence of disease in those already infected. Provision for the care of developed cases is an important part of his work under the first heading, aside from its social and humanitarian value.

**Infective Agent.**—In 1882, Koch announced to the world that he had solved the question of the specific agent producing tuberculosis. Subsequent investigation proved his contention to be correct. The organism is a bacillus of the acid-fast variety, enveloped in a waxy sheath, and does not produce spores. Sunlight and heat kill it quickly, while it can persist in dark, damp places for a considerable time. The phenol disinfectants destroy it readily, if given sufficient time to act.

Besides the human variety, avian, piscine and bovine types of the tubercle bacillus are recognized. Fortunately, only the last of these is pathogenic for man, and this power diminishes in the ascending age groups.

**Incubation Period.**—If we consider the incubation period as the time elapsing between infection and appearance of recognizable symptoms, we may say that it is measured in months or years for tuberculosis. It is practically impossible to determine the exact time of first exposure, but it is common experience to see children succumb to a tuberculous meningitis very early in life and sometimes within a few months following the development of an "open" case in a parent. On the other hand, figures such as those given in the opening of this chapter indicate a high percentage of early infection without immediate symptoms. The fact that children of 10 years or over give an almost universally positive tuberculin test seems to bear out the theory of early infection. If this be true, we may say that the incubation period is usually measured in years, or, at least, that there is a long period of latency preceding that of active development.

**Immunity.**—Rosenau estimated in 1912 that 160,000 persons died annually in the United States of tuberculosis. Compared with an estimated infection rate of 90 per cent., it is evident that a rather high degree of natural immunity exists among us. This resistance has been steadily increasing during the period for which we have any accurate statistics. In Massachusetts the death rate per 100,000 of population had fallen steadily from 400 to 160 in the period of 1850 to 1902. This selective process was at work prior to any concerted efforts at control, but the decline was slightly accelerated after discovery of the tubercle bacillus.

Karl Pearson and other careful statisticians have demonstrated that susceptibility to tuberculosis in children bears the same relationship to tuberculosis in the parents as does eye color, color of hair, insanity, and other hereditary characteristics. This observation has an important bearing upon the question of control measures. A certain proportion of the population will inherit more or less of a tuberculous tendency, depending upon the germ-plasm which produces it. Regardless of environmental conditions, it will hand on this weakness to succeeding generations, modified by mating. These considerations lead us into the field of eugenics, which is aside from the subject of this section. The point to consider is that a certain number of individuals will be continuously brought into the world who are not resistant to tuberculosis. Proper environment will raise the body resistance of these individuals themselves, in many cases to such a point that they will never develop the disease, or will recover from it, if attacked. We may conceive of a "threshold of resistance" for each individual. If his vigor is maintained above this point, he will successfully combat infection; but lowered vitality will approach or fall below this threshold, when he will succumb. Even for the most resistant, such a point may be reached by a wasting disease or other catastrophe.

It is believed that infection successfully combated confers a degree of acquired immunity upon the individual, based upon the fact that the incidence of disease diminishes after 30 years of age. However, immunity cannot be produced by any artificial means at hand today. Tuberculin does not act in the manner of vaccines or serums, by producing or introducing demonstrable antibodies. It does, however, stimulate the combative forces of the body against active tuberculosis, in some unexplained manner.

Another factor affecting the acquisition of tuberculosis is the size and frequency of dose. A few bacteria in a fairly resistant person will have no effect whatever and will die quickly. On the other hand, a massive dose received by the same person may produce active disease. Again, small doses frequently repeated will establish a state of sensitization which may end in disease. All of this has been demonstrated in experimental animals and to some extent by studies of human infection.

Immunity to tuberculosis, then, is a relative condition, limited by both heredity and environment.

**Modes of Transmission.**—With infection widespread and with 70 per cent. of those having active disease throwing off tubercle bacilli in sputum and saliva, contact is obviously the principal mode of infection. Either sputum spray and kissing, or cups, spoons, pipes and all articles recently soiled with the saliva of a patient will convey fresh, virulent organisms to other persons.

Far too much emphasis is laid upon dust as a conveyor of infection. While it is true that the tubercle bacillus can survive in the dry state, when protected from sunlight, the amount of really actively infective material that might be so spread is relatively minute as compared with the enormous amount of fresh and more highly dangerous matter that comes directly from the patient himself. Dried sputum is rather hard and becomes finely pulverized with difficulty so that few living bacilli could enter the atmospheric dust from this source.

For the bovine type of tuberculosis the only important vector is cow's milk. It is not necessary that there should be an infected udder, but bacteria can find their way from the circulation directly into the milk without leaving any traces in the lacteal glandular tissue. Probably most bacilli enter milk through contamination from manure due to careless milking methods.

There is no so-called hereditary transmission of the disease. Only a hereditary lack of resistance is transmitted. Occasionally a fetus may become infected *in utero*, but this is quite rare and is not hereditary transmission in the correct sense of that term.

**Diagnosis.**—Only a few points need be emphasized in connection with diagnosis. Expert physical examination made at the first appearance of suspicious symptoms is the prime requisite. Nothing yet developed will take the place of that. There are, however, aids such as the roentgen ray, sputum examinations and possibly the tuberculin test, that will be of help in some cases. Complement fixation gives some promise, but has not yet been fully recognized as a diagnostic method.

For the sake of the patient and his associates, *early* recognition of active disease is absolutely essential. By the time a hemorrhage has appeared or bacilli can be found in the sputum, chances of recovery have diminished considerably and infective material has been spread about by the patient.

Early and frequent use of the laboratory, for the examination of sputum, should be made in all cases. Tubercle bacilli and elastic fibres in sputum are always important indications, when coupled with suspicious physical findings.

In very young children presenting suggestive symptoms, the cutaneous tuberculin test may be of considerable value, for many in the first three or four years of life have not developed a positive reaction to tuberculin and will do so only at the time of infection. Later in life the test is of little value because of almost universal reaction to it.

**Methods of Control.**—If we could prevent infective material from reaching any of the susceptible population, we should soon wipe out tuberculosis entirely. However, this is an ideal that we cannot hope to see attained in this generation, if ever. From the cradle to the grave we are constantly exposed to infection. Our efforts then must be directed toward preventing as much exposure as possible, which is the first of the two main lines of attack. The other group of control measures comprises all those that will tend to prevent development of diseases in persons infected.

Since the patient with a discharging lesion in any part of his body is the chief source of infection, he must be taught to destory all infective material before it has had an opportunity to reach any other person. Burning, boiling and the use of strong phenol solutions will accomplish this effectively. If the patient is too selfish or ignorant to observe such precautions, the health authorities should step in and isolate him. Articles used by the patient must also be disinfected before being used by anyone else. Common cups must be absolutely forbidden in all public places and dishes used by restaurants and soda fountains must be thoroughly cleaned.

In connection with the control of the patient, tuberculosis sanitoria find their greatest usefulness from the public health standpoint. The same applies to public tuberculosis clinics.

Especial watchfulness is required over all children in the homes of the tuberculous. Every care should be exercised to destroy sputum, avoid coughing and kissing and in the disinfection of the patient's eating utensils.

An efficient local health department will be able to prevent bovine infection through the milk supply. Cows should be tuberculin tested twice annually and all positive reactors removed from the herds. If inspection is not obtainable, pasteurization of the milk will destroy tubercle bacilli easily.

Physicians should be educated to a realization that the patient need not be sent away from home in order to obtain a cure. We see many hundreds who have been cast adrift in the West, to become a menace to all with whom they come in contact. From the public health standpoint, it would be far better for such persons to remain at home under the control of their physicians, if they are unable or unwilling to employ such care away from home. This is aside from any consideration of benefit to the patient himself.

We come now to the methods which may help to prevent development of disease in those infected. There is a certain type of child that has been given the name "pretubercular," because of obvious hereditary susceptibility, poor physique, anemia, or for other reason. Whether exposed to tuberculosis or not, such children need special attention in order to overcome a natural handicap as far as possible. Open-air schools, day and night camps, visiting nurses, free clinics, etc., all operate to care for children of this class.

For the adult, education is our main reliance. Three things should be emphasized repeatedly and as widely as possible.

1. Periodic examinations, done at least once a year, to determine any signs of incipient tuberculosis, as well as other disorders.

2. The majority of persons do not know what to select in the way of nutritious food, nor how to prepare it. More general instruction in the fundamentals of dietetics should be given in our schools and through the press. Hand in hand with this should go a thorough training in hygiene.

3. The principles of eugenics as applied to the selection of a healthy mate should become matters of everyday

knowledge. For persons of tuberculous heritage, who are already mated, a warning should be repeatedly given of the liability of their children to develop tuberculosis and ample advice made available as to the best methods of fortifying the body against such a contingency.

Every health department should maintain a free clinic for the indigent tuberculous and for those who desire periodic examinations. Such a clinic provides a center of public health education that has a certain prophylactic effect, aside from the opportunity afforded to control the patient who may otherwise spread infection. Follow-up and social service work from such a center are also important adjuncts to control.

In this connection tribute should be paid to the graet Association that has spent funds and energy unlimited in an effort to educate the public upon the important facts regarding tuberculosis. The fruit of its labor can be seen in the general enlightment upon this subject as well as in the many sanitoria, clinics and nursing agencies that have been established throughout the land. It has been an important factor in gaining better support for state and local health departments and in pointing the way to better public health in general. However, many functions performed by the National Tuberculosis Association should now be taken over by public agencies, for they are a part of public health administration that should not be left to private enterprise.

**Mortality.**—As was stated earlier, there were 160,000 estimated deaths from tuberculosis in 1912, in the United States. Definite figures for the registration area alone, for 1917, are as follows:

| | |
|---|---|
| Tuberculosis of the lungs............ | 88,666—rate of 123.8 per 100,000 |
| Tuberculous meningitis............. | 5,706—rate of 8.0 per 100,000 |
| Other forms of tuberculosis.......... | 7,024—rate of 9.8 per 100,000 |
| Total.......................... | 101,396—rate of 141.6 per 100,000 |

From these statistics it is evident that the "great white plague" is no misnomer. The facts call for concerted, continuous action, especially along the indicated lines of education until future generations have bred a race that can withstand the heaviest onslaughts of tuberculosis.

## 37. TYPHOID AND PARATYPHOID FEVER

Because of their practical identity in sanitary features, the two diseases forming the subject matter of this chapter have been grouped together for consideration. Typhoid fever will be taken as the type, with occasional references to differences between it and the paratyphoid fever, types A and B.

For several decades, typhoid fever engaged the attention of clinicians, bacteriologists and sanitarians to a degree probably unequalled by any other disease and with a resulting literature of formidable proportions. Such concentration of effort has had a stimulating reaction upon both bacteriology and sanitary engineering which has lead to the opening up of many important lines of investigation closely allied to the control of typhoid fever. The subject affords an excellent illustration of what was said in the introductory chapter and of the application of the modified "Whipple's Figure" to a concrete case. It emphasizes especially well the duties of the attending physician as distinguished from those of the health officer, at the same time demonstrating the necessity for the cooperation of these two in safeguarding the community.

The name of the disease gives a hint of its history, for it was confused with typhus fever for many generations, and, when finally distinguished from the latter infection, was called typhus-like, or typhoid fever. Unfortunately, some physicians still fail to make this distinction in reporting their cases. Other names have been given it, such as "enteric fever," but typhoid has come to be generally accepted as the proper term.

In 1910, one person in every 400 of the population in the United States had typhoid fever. Scarcely a single community of 1,000 persons, or over, escaped some infection. Since then conditions have been improving rapidly, but are far from what should be expected. A comparison of certain American and European cities for the year 1910 shows that there was an excess of 18 deaths, per 100,000 of population, from typhoid fever in the American cities, all of which might have been prevented by the application of principles that were well understood abroad. Today, the typhoid fever death rate in many of our cities is quite as low as any in the world. But most of our smaller towns and rural communities still leave much to be desired in this respect.

Considering these facts, we are forced to agree with Prof. William T. Sedgwick, who said, "The experience of various communities, some large and some small, in first exterminating and then for the most part keeping off the disease, has demonstrated the possibility of its control. It is therefore impossible to avoid the conclusion that communities in which typhoid fever abounds are either ignorant or careless; and ignorance and carelessness are the ear marks of a defective civilization."

**Infective Agent.**—In 1880 Eberth and Koch simultaneously observed the typhoid bacillus in specimens of tissue from typhoid cases. Gaffky succeeded in isolating it in pure culture, four years later, offering at that time satisfactory evidence of its identity.

Unfortunately laboratory animals are not readily infected with *B. typhosus* in the same manner that it is acquired by man. Injected into the blood of such animals it gives rise to immune substances and to pathological processes that are quite similar to human reactions. We do have good evidence of the specificity of the bacillus, however, through its constant presence in undoubted cases of clinical typhoid fever, as well as from the accidental ingestion of cultures by laboratory workers, with subsequent development of typical symptoms. The specific agglutination reaction (Widal) is also confirmatory.

The organism is essentially a human parasite and finds few environments outside of the body favorable to its multiplication. The principal exception to this rule is milk, in which the bacillus proliferates rapidly until overcome by the lactic acid organisms. Water is frequently a vector of typhoid bacilli, but there is no evidence that they ordinarily multiply in it; rather, they tend to die off in great numbers, leaving only a few of the most resistant for any length of time. Many factors affect their longevity in water, such as rate of flow, sedimentation, aeration, etc. These aspects of the subject were discussed in former chapters. An interesting fact of some importance is that the bacillus does not find sewage as favorable a medium as water, for its continued existence.

While heavy soil pollution with typhoid-bearing feces might result in the contamination of vegetables, the infective material would have to be quite fresh and the vegetables used promptly in the raw state to produce infection. The soil is a generally unfavorable medium for the bacillus, although not always so.

A temperature of 80° C. kills *B. typhosus* in one minute. This has an important bearing upon pasteurization of milk supplies. The organism is also killed by drying and by sunlight in a few hours, while the disinfectants commonly used inhibit or destroy it easily. Freezing, while preventing growth and killing a large percentage of the organisms, does not destroy all. One famous outbreak of the disease was traced to a patient's feces that had been thrown out on the ground during freezing weather and had been washed into a stream during the spring thaw.

**Incubation Period.**—Two weeks is usually given as the average period of incubation in typhoid fever, but it may vary from one to four weeks. There seem to be some indications that persons may occasionally carry the organisms for months before manifesting signs of disease.

**Immunity.**—While the figures on age distribution would indicate on their face that early middle life was the period of highest incidence this is probably an erroneous impression due to failure to recognize typhoid fever in children. In fact, until recently, it was taught that children rarely had the disease, while today we are receiving reports of an increasingly large proportion of such cases. The decrease in incidence as we ascend in the age scale is probably due to a constant reduction of susceptible material. No doubt a very small proportion of the population is naturally immune.

An attack of the disease usually confers immunity for life, but this is not constantly true.

A high degree of immunity can be produced by means of prophylactic "vaccine." To this agent we owe the remarkable record of our Army. In 1910 the ratio of cases to 1,000 of mean strength was 2.43. During September 1911 compulsory vaccination against typhoid was introduced and the ratio fell to 0.85 for that year. In 1914 the figure was 0.07. Despite the stress of the war just ended, only about 750 cases developed in our entire Army, part of which was due to faulty technic and failure to give the complete prophylactic treatment.

Immunity by vaccination continues for about two years, if a preparation of good quality is used. Recently, a so-called lipo-vaccine has been tried, but it has failed, so far, to give adequate protection. It is advisable to use a combined vaccine, containing typhoid and paratyphoid A and B, for one does not protect against the other.

**Modes of Transmission.**—While the typhoid bacillus may reach its human host by means of water, milk, food, flies and direct contact, we must always bear in mind that a case of typhoid fever means that the victim has received into his digestive tract the bowel discharges of some other person. The only exceptions to this are those few who are infected by sputum spray of patients who happen to have the bacteria in their throats. If this general principle is kept constantly in the foreground, investigation and control of the sources of outbreaks will be much simplified. Yet it is surprising that many who should know better will ascribe the trouble vaguely to "water" or "milk," apparently not realizing that these things are mere vectors in which the disease cannot arise *de novo*. As was said at the outset, search for PERSONS, NOT THINGS. In our search for the person, however, we are compelled to follow an inductive process, so to speak, investigating in turn the various possible modes of transmission.

In the earlier days of sanitary science, water held first place as the vehicle by which typhoid fever was conveyed from man to man. Our cities and towns drank the raw water into which their neighbors poured their sewage, or they even drank their own sewage at times. That their typhoid fever rate could be anything else than high was not to be expected, for a short circuit was established between patient and non-immune through sewer and water pipes. As knowledge of the natural history of typhoid fever became more general and complete, this mode of transmission was successfully attacked and controlled. It is always to be considered, however, if a water supply is not properly safeguarded.

Milk is frequently contaminated by those who have to do with its production or distribution. From the hand of the milker to that of the delivery boy, it is always subject to possible pollution in its passage through the dairy to the consumer. Many outbreaks have been traced to a case or carrier on a dairy. One of the authors investigated a small epidemic in a western town where it was found that a bottler in a dairy had been at work while developing typhoid fever. Thirty-four cases arose from this source.

Food is occasionally contaminated in the course of preparation by the hands of the cook who is a carrier. An outbreak of this type was traced to a dish of macaroni served at a large picnic. The dish had been prepared by a typhoid carrier and it was found, by duplicating the process, with a culture of bacteria added purposely, that baking did not destroy those organisms in the center of the mixture. Evidently heat was not applied for a sufficient length of time to penetrate thoroughly.

It has been definitely proved that flies can carry typhoid bacilli on their feet and in their digestive tracts. That they deposit bacteria wherever they alight is demonstrated by the growth secured on sterile dishes of culture medium when thus contaminated. Typhoid bacilli have repeatedly been recovered from the feet and excreta of flies. Wherever human excrement is deposited, there will be found the fly. If no barrier is erected against him, he will promptly carry his burden of disease-laden filth to the kitchen and the table.

A considerable number of cases of typhoid fever arise from direct contact with the patient, or with things he has recently soiled. Since the bacteria are found in all parts of the body during disease, all secretions and excretions can be considered as infective, at one time or another. This is constantly true of the urine and feces. It is dangerous, therefore, to tell the family of a patient that typhoid fever is not contagious. If discharging abscesses or sinuses develop in the course of an attack, they should receive particular attention, for typhoid bacilli abound in their exudates.

We have already spoken of contamination by the hand of milker or cook. It is by this means that the typhoid carrier most frequently spreads his infective excreta broadcast. The carrier condition is the most prolific source of endemic typhoid fever in any community, while it may also give rise to extensive epidemics at times. All active cases are carriers for a period of two to eight weeks after fever has subsided. Some few become chronic, discharging typhoid bacilli constantly or intermittently for years, or even a lifetime. Their proportion in the total population of any city has been estimated from laboratory investigations to be 0.3 per cent. to 0.4 per cent. of the whole. That they are of extreme importance is illustrated by the famous case of "Typhoid Mary." Because some have regarded this history with skepticism, we give it at length in the words of the bacteriologist who traced her wanderings and had her case in charge. The following is quoted from Park and Williams, "Pathogenic Microorganisms."

"A remarkable case of a cook ("Typhoid Mary"), discovered by Soper, was under our care for three years. A visitor of the family in which this woman was cook developed typhoid fever some ten days after entering the household. This was in 1901. The cook had been with the family three years and it is difficult to judge which infected the other. The cook went to another family. One month later the laundress in this family was taken ill.

"In 1902 the cook obtained a new place. Two weeks after arrival the laundress was taken ill with typhoid fever; in a week a second case developed and soon seven members of the household were sick.

"In 1904 the cook went to a home in Long Island. There were 4 in the family as well as 7 servants. Within three weeks after arrival 4 servants were attacked.

"In 1906 the cook went to another family. Between August 27 and September 3, 6 out of its 11 inmates were attacked with typhoid. At this time the cook was first suspected. She entered another family on September 21. On October 5 the laundress developed typhoid fever.

"In 1907 she entered a family in New York City, and two months after her arrival 2 cases developed, 1 of which proved fatal.

"The cook was removed to the hospital March 19, 1907. Cultures taken every few days showed bacilli off and on for three years. Sometimes the stools contained enormous numbers of typhoid bacilli and again for days none would be found. She was released on parole in 1910, promising to report to the Health Department and not to engage in cooking. She broke her parole and disappeared. In 1915 in an epidemic of typhoid at a maternity hospital, a total of 25 cases developed. Investigation showed that food infection was the cause and the cook was identified as "Typhoid Mary." During the disappearance she infected a friend and was the cause of several cases in a small private sanatorium. She is known to have been the cause of at least 50 cases of typhoid fever. We recently traced some hundreds of cases of typhoid fever to a milk supply produced at a farm, looked after by a typhoid carrier who had typhoid fever forty-seven years ago."

Simon gives an equally striking example of long continued carrier infection, while the literature is full of many other instances.

In closing our discussion of the transmission of typhoid fever we can do no better than to quote the words of Dr. William Budd, an English physician writing upon the subject in 1873; "The members of the great human family are bound together by a thousand secret ties of whose existence the world in general little dreams. And he that was never yet connected with his poorer neighbor by deeds of charity or love, may one day find, when it is too late, that he is connected with him by a bond which may bring them both to a common grave."

**Diagnosis.**—In the absence of an outbreak, typhoid fever is often confused with such diseases as malaria, influenza, pneumonia, tuberculosis, paratyphoid fever, and, in some localities occasionally, with Malta fever. Aside from the clinical evidence, reliance should be placed upon the laboratory for differentiation.

In the first week of infection, the blood carries its highest percentage of bacteria. At that time a blood culture will demonstrate the presence of infection in the majority of cases. As the disease progresses the bacteremia diminishes, but a new feature of importance presents itself, viz., the agglutinating property of the blood serum which gives us the Widal reaction. This test is practically specific for the infecting organism, whether typhoid or paratyphoid. In the latter disease, however, the reaction appears earlier than in the former.

Some care must be exercised in interpreting the Widal test, as it will persist for years in a person who has had typhoid fever and is present for at least two years in those who have had prophylactic vaccination. Another point of interest is that in a person vaccinated against typhoid fever only, and suffering from paratyphoid fever, his blood serum may agglutinate typhoid bacilli more strongly than it will the paratyphoid organism causing his infection. Thus a case of the latter disease may occasionally be incorrectly diagnosed as typhoid fever. However, from the standpoint of sanitary control this is unimportant.

A carrier will usually give a more strongly positive Widal than a non-carrier who has recovered from typhoid fever. This is important in a search for possible carriers during an outbreak of the disease. Final determination of the carrier state, however, should depend upon repeated bacteriological examinations of both stools and urine.

**Methods of Control.**—The individual cannot protect himself against typhoid fever unaided, save by the regular use of vaccine. The problem involves individual, household and community cooperation.

A person suffering with the disease may be dangerous to his immediate entourage and also to the community; in the first case by contact, and in the second by dissemination of his excrement. To protect others who are in immediate contact, prophylactic vaccination should be done promptly and concurrent disinfection of all discharges and of articles soiled with them should be established at the first suspicion that typhoid is present. The stools and urine are particularly dangerous and must be thoroughly mixed with a strong disinfectant, allowing them to stand in this solution for two hours, before being disposed of. Their final disposition is also important, as a few bacteria may occasionally escape destruction. Where water carriage sewage disposal is not available, the stools and urine should be buried in the ground at a distance from any well or garden. The depth at which they are buried must not be over one foot, as we rely upon the soil bacteria for further purification.

As added protection to the community, flies must be rigorously excluded from the sick room and from contact with the patient's discharges. If any member of the family is engaged in milk or food handling, he should never be permitted to have access to the sickroom or to touch anything that the patient has handled.

As was stated earlier, the convalescent patient is a carrier for a greater or less period of time. Many health departments require that his stool and urine be submitted to an approved laboratory for examination as to the presence or absence of typhoid bacilli. If present, the patient is released only under especially prescribed conditions, and these conditions should remain in effect until at least three successive negative specimens, taken fifteen days apart, have been secured. Until such conditions have been met, the carrier must be considered dangerous and under no circumstances should he be permitted to engage in the production or handling of milk or other food for public consumption.

Control of the chronic carrier is a vexing public health problem. Some gradually eliminate their infection by natural processes, but others may continue to discharge organisms for a lifetime. No medical treatment so far devised has cured all cases. Better results have been secured by removal of the gall bladder, for it has been demonstrated that it is this organ which harbors the organisms and permits their multiplication. Experimental evidence indicates that only an inflamed gall bladder will retain the bacteria and it has been further shown that the condition is quite frequently associated with gall stone formation. This latter fact can be used in making a search for carriers, as a history of disturbance in the gall bladder would indicate thorough examination of stools in a person already under suspicion.

While chronic carriers usually discharge bacilli constantly, a single negative test should never be accepted as final, especially in the face of a positive Widal, or of indications of gall bladder inflammation. We occasionally find an "intermittent" carrier who may give one or two negative specimens before the bacteria are found.

The investigation of an outbreak of typhoid fever affords the health officer a most interesting opportunity to apply his knowledge of epidemiology. While he is certain that a *person* is ultimately responsible for the infection, he may be compelled to follow many clues before definite solution of his problem is reached.

Water borne outbreaks may be explosive in character, or may develop gradually and continue over a long period of time, dependent upon whether they are caused by a single large pollution, or by a constant and smaller one. Often it is necessary to make a survey of the entire water shed in order to discover the source of contamination. Closely allied to the question of water purity is that of sewage disposal above the source of supply and the method of sewage treatment. This entire subject is considered elsewhere.

If a water supply is proved to be above reproach, we still have to deal with those other factors that are responsible for what is termed "residual" typhoid. Of these milk is the most common medium for typhoid dissemination, for it is handled by many persons and is an excellent culture medium for bacteria. The characteristic of most milk borne outbreaks is their explosiveness, all cases developing together within a week or two. A carrier is usually responsible for such contaminations. Constant and thorough inspection of dairies is the remedy, together with pasteurization. The latter should always be instituted as an emergency measure, if the milk supply is suspected.

Food is occasionally a factor in spreading typhoid fever, due to contamination directly by a carrier or by typhoid bearing sewage.

In small towns and rural districts the fly probably plays a leading role in disseminating typhoid because of the universal prevalence of insanitary privies or the disposal on the open ground of human wastes from typhoid cases or carriers. Rural sanitation is doing much to eradicate this evil, but must wait upon full-time health organizations, before rural typhoid can be reduced in proportion to the reduction accomplished in cities. At present, the amount of typhoid fever in any state is directly proportional to the percentage that the rural population bears to the whole.

The one method of typhoid fever control that would give the largest reduction in the shortest time is universal vaccination. While its complete application can never be expected, much can be done to educate the public to its acceptance, by offering the excellent evidence which we have of its efficacy.

Education in hygiene and sanitation will be a potent factor in the eradication of typhoid in proportion to the energy exerted by the health authorities in its dissemination. The public is genuinely interested in health protection, but it does not want a mass of vague theories, such as have been served up in the past, only to be repudiated. The health officer should take the public into partnership in his program of sanitation, for the public is, after all, the most interested party in the matter.

To sum up, then, typhoid fever control can be expressed in one word, CLEANLINESS in its sanitary significance; clean water, clean milk, clean food, clean excreta disposal, clean patients, and, always, clean hands. Lacking these essentials, we shall continue to have typhoid and to demonstrate thereby that it really "*is* a disease of defective civilization."

**Mortality.**—In 1918 there were 10,167 deaths from typhoid fever in the Registration Area of the United States. Of these deaths 6,405 were in the rural sections of the registration states. On an average there are ten times as many cases of typhoid as there are deaths, which would give over 100,000 cases for 1918 in the Registration Area alone. Taking the figure 0.3 as the percentage of chronic carriers arising in the population generally, we find that over 300 such persons were turned loose upon their communities in this area alone, each one becoming a potential source of disease and death, for many years or for life. Until public intelligence is aroused to the point of demanding a thoroughly scientific attack upon the disease, typhoid fever will continue to reap its annual harvest of death.

## 38. TYPHUS FEVER

Typhus fever, formerly known as "ship" or "jail" fever, was confused with typhoid and relapsing fevers for many years. It is the rise of bacteriology that made exact differentiation among these diseases possible. Typhus, once a major disease, declined rapidly in frequency and virulence in the civilized world during the nineteenth century, but subsequent to the World War it spread in epidemic form through the Near East, and has invaded portions of Central Europe. The fact that typhus is endemic in Mexico, and that cases occasionally present themselves at the International Boundary, brings the menace to our own doors and demands our especial interest in the disease. It has gained entrance through eastern ports, on several recent occasions, and an outbreak also occurred among the Navajo Indians in the spring of 1921.

We should note that the so-called "Brill's Disease" seems to be a modified form. In this attenuated form typhus is to some extent endemic in several of our larger cities.

**Infective Agent.**—The specific organism of typhus has not been finally identified. A minute body designated as *Rickettsia prowazeki* appears to be the infective agent, but the evidence is not all in, as yet. Cultivation in the laboratory has been beset with difficulties.

**Incubation Period.**—Experimental typhus in the guinea pig has an incubation period of from 7 to 10 days.

**Immunity.**—There is only a slight degree of natural immunity to typhus in the general population. Immunity to the more severe form of infection may be acquired by an attack of the disease or of the mild type described by Brill. The work done by Plotz, by which it was originally hoped to demonstrate the causative organism and make possible a prophylactic vaccine, has not been confirmed.

**Modes of Transmission.**—So far, the only known natural method of transmitting typhus is by the bite of the body louse that has previously fed on an infected person. This fact has been well established by experimentation. Infection may be experimentally transferred through injection of the blood of a typhus victim into a healthy individual. All the elements of the blood seem to carry the infective agent. No other methods of infection have been demonstrated. Lice that have bitten typhus patients are said to retain their infectivity from 2 to 10 days. It has not been fully demonstrated whether the virus is injected with the bite or is discharged upon the skin with the dejecta of the louse, to be rubbed into the minute wound by the victim himself.

**Diagnosis.**—Typhus is to be distinguished from typhoid and the relapsing fevers. This is easily done in the case of typhoid by the presence of a positive Widal reaction. Relapsing fever shows the spirillum of that disease in the blood. Another affection which might possibly be confused with typhus is Rocky Mountain spotted or "tick" fever. The onset in the latter, however, is usually much more gradual, occupying a period of five days or more before fever reaches the fastigium. The outstanding features of typhus are the sudden onset, headache, prostration, and an eruption which gives a dusky red color to the skin, interspersed with rose spots and petechiae described as resembling a mulberry. The eruption choses the trunk and extremities rather than the face.

Guinea pig inoculations with the patient's blood serve to distinguish typhus from Rocky Mountain spotted fever. The latter disease produces gangrenous areas in the skin of the animal, which is not the case in typhus.

An agglutination test, known as the Weil-Felix reaction, is considered as specific in typhus. The patient's blood has the power of clumping a proteus-like bacillus, through the formation of a non-specific agglutinin. This is a quite unusual phenomenon among such reactions.

**Methods of Control.**—Control of typhus depends upon eradication of the louse. This subject was discussed in the chapter on pediculosis, and will not be repeated here. No other precautions are necessary, in the presence of typhus, than to prevent infestation with lice. Closely fitting garments, closed at the openings with adhesive plaster, should be worn by all attendants. When these garments are removed, they should be wrapped in a sheet and steamed or boiled, or soaked in gasoline, before being handled again. Delousing measures should be applied to the affected population groups at once, whenever typhus is diagnosed. See the appendix for delousing methods.

Contacts should be held in quarantine at least 14 days, and better for 21 days.

**Mortality.**—Typhus has a case fatality rate of about 20 per cent. in the severe type. Mortality rises rapidly after 30 years of age and nearly all persons beyond 50 succumb to typhus. Brill's Disease is not fatal in more than one per cent. For this reason, infection with the latter disease has been recommended as a prophylactic for those who must work in typhus districts.

## 39. THE VENEREAL DISEASES

The four diseases which form the subject of this and the following section constitute the most serious problem, by far, that confronts the sanitarian. Destructive though tuberculosis and cancer may be, they are far outdistanced by syphilis alone, which lays its blighting hand upon one tenth of our people and claims for its own even the second and third generations of those who fall its victims.

Yet, six years ago, scarcely a state required that these diseases be reported. They were rarely mentioned in the public press. To speak of them outside of professional circles was to brand oneself as vulgar. In so short a space of time has public sentiment been reversed that practically every state requires that they be reported and controlled. The daily papers carry many columns of news matter regarding them. Their nature and prevention are being taught in our elementary schools and higher institutions of learning. A great army of men and women is engaged in many lines of activity directed toward their eradication. This movement denotes a healthy tendency in that such diseases are being lifted from the realm of the quack, the dive keeper, the grafting politician, the limbo of things taboo, and placed where they rightfully belong among those problems of medicine, hygiene and sociology that are receiving the earnest attention of the most able minds.

A realization of the extent to which syphilis and gonorrhea were sapping the vitality of our race had been growing among those who had made a systematic study of the problem, for several years prior to the war. It was the gathering of our young manhood in the camps, however, which crystalized this sentiment into the most comprehensive program of health education ever conceived, education which is today finding its way into the remotest hamlets of our land. To this problem, developed by our government and adopted by every state of the Union, we owe that enlightened public opinion which demands that these diseases be dragged into the open and destroyed.

For many generations, profession and laity alike have grouped the four diseases which we are discussing under the heading "venereal" or "social diseases," or "bad diseases," thereby stamping them as vulgar, or worse, and placing their victims without the social pale. We know now that no more unscientific and disastrous policy could have been adopted. The newborn infant, blind because of a gonorrhea in its mother, is surely no hardened sinner. The innocent wife made childless and a life-long invalid, because of an infection from her husband, is no evil doer. The trusting young girl who acquires a chancre of the lip from the kiss of her lover is no moral outcast. Yet these innocent infections constitute a high percentage of the so-called "venereal" diseases and those who suffer their effects have been classed with the prostitute, the pimp and the criminal. But a better day is upon us and we are learning to recognize these diseases as exactly on a par with all others that are infectious and, therefore, within the purview of the health authorities.

Not until the war called together our young men from every state did we realize the full extent to which such infections had taken root among us. Of the second million who came to the army camps, an average of over five in every hundred were suffering from one or more of these conditions. For various states these figures differed through a wide range. What the figures would be if we could count every woman infected, every child with gonorrheal ophthalmia or hereditary syphilis, every older man with latent disease in his body, no one can say.

However, it is not in numbers alone that these diseases hold interest for the health officer, but in their profound and far-reaching effects. As has been suggested, gonorrhea is an important cause of infant blindness. Moreover, about 75 per cent. of women who come to the operating table for pelvic conditions are brought to their pitiable condition by the affection. One writer has said that, were it not for gonorrhea, the specialty of gynecology would be merely an insignificant branch of abdominal surgery. But gonorrhea, with all its train of ills, is as nothing when compared with syphilis. Osler said that to know syphilis in all of its manifestations was to know the practice of medicine, for there is scarcely an ailment known to the physician which syphilis may not simulate at some stage of its development in various patients. No tissue or structure of the body escapes its inroads. Even the foundations of reason may fall before its attack, while the unborn babe, and the generation to follow it, are not spared. Is not such an adversary worthy of the best efforts of the world to conquer it?

Space will not permit of more than an outline of the subject. However, because of its supreme importance, a separate section will be devoted to the question of control, which is much the same for the entire group.

## BALANITIS GANGRENOSA

Because it is a genital infection, balanitis gangrenosa is included in the group of "venereal" diseases. It is rather rare and has no great importance, except to the unfortunate victim, in whom it often produces a complete destruction of the external genitals. A condition known as erosive vulvitis, in females, has recently been rather conclusively shown to be identical with balanitis of the male.

**Infective Agent.**—The infective agents are a spirochaete and a fusiform bacillus, which are always associated in the lesions.

**Incubation Period.**—The incubation period is not definitely known.

**Immunity.**—Although we do not known positively, it is probable that there is a rather high immunity to this infection, for it is comparatively rare.

**Modes of Transmission.**—There is but one mode of transmission, through sexual intercourse with an infected person. It is usually found in those who are extremely unclean in their personal habits.

**Diagnosis.**—In the male, diagnosis is easy by reason of the destructive gangrene that attacks the genitals, destroying the whole external apparatus in a few hours, at times. In the female, as well as in the doubtful male case, recognition of the spirochaete and its associated bacillus in smears of exudate from the deeper parts of the lesion will reveal the nature of the disease.

**Mortality.**—A man occasionally dies from a rapidly spreading gangrene, which sweeps up over the abdomen, melting all structures before it.

## CHANCROID

Chancroid is of interest principally to be differentiated from the initial sore of syphilis. It is painful and disabling, particularly when it invades the inguinal glands, but is not serious nor fatal.

**Infective Agent.**—The streptobacillus of Ducrey is the causative agent.

**Incubation Period.**—The lesion appears within a week after infection, usually in from two to four days.

**Immunity.**—Probably all persons are more or less susceptible, but the organism is frail and easily killed, so that the incidence of infection is low.

**Modes of Transmission.**—Chancroid is practically always acquired through sexual intercourse. From the initial sore the patient may infect other parts of his body, since the exudate is highly infectious, when fresh. Very rarely, intimate contact may produce an extragenital lesion in another person.

**Diagnosis.**—The question of diagnosis of chancroid is closely wrapped up in the larger one of syphilis. The whole problem is the positive elimination of the latter infection, and what is said as to diagnosis of the initial lesion of syphilis applies as well to chancroid. No person who is familiar with the two diseases will attempt, today, to make a diagnosis upon the appearance of the sore alone. To do so is to be guilty of malpractice and to endanger the future happiness and the very life of a patient. REPEATED DARK FIELD EXAMINATIONS OF EXUDATE FROM THE *UNTREATED* LESION IS THE ONLY SAFE PROCEDURE. Even then, the patient should be carefully watched for constitutional symptoms suggesting syphilis and many Wasserman tests made upon the slightest suspicion of the latter disease.

**Mortality.**—The disease *per se* never kills, but a complicating septicemia may occasionally result fatally.

## GONORRHEA

In times which are happily past for the most part, the medical profession maintained an indifferent or hostile attitude toward the patient with gonorrhea. The public acquired the notion that the disease was "no worse than a bad cold." This combination of ignorance and indifference bred suffering for the patient, with frequent disaster or death to the members of his family. We know now that gonorrhea is a formidable disease, particularly when it affects women and when it is implanted in the eyes of infants or adults. Of the latter affection we have already spoken in a former section, while the seriousness of the female genital infection was mentioned in the introduction to this discussion.

The chief difficulties which the disease in both sexes presents are its resistance to our usual methods of treatment and its tendency to chronicity, with often little manifestation, until aroused by some extraordinary condition. Until the medical profession takes the trouble to become proficient in methods of diagnosis and treatment, and learns to treat the patient until he is *really well*, gonorrhea will continue to reap its pitiful harvest of wrecked homes and blinded children.

**Infective Agent.**—The diplococcus of Neisser, or the gonococcus, is the infective agent. It is a small diplococcus that is found within the bodies of the pus cells and is negative to Gram's stain. It is of the same class as the pyogenic organisms.

**Incubation Period.**—One to three days is the usual period of incubation.

**Immunity.**—Natural immunity appears to exist in an occasional person, but the great majority of humanity is quite susceptible. One attack does not confer immunity.

**Modes of Transmission.**—Practically all adult genital infection is acquired through sexual intercourse. This should by no means convey the impression that it is associated with illicit relations in all cases, for a large part of female infection is innocently acquired from an infected husband and the husband may so receive it from his wife. Genital infection acquired by other means than that mentioned is so rare as to be a curiosity, when occurring in an adult. Eye infections of the newborn are received from the mother, at the time of birth, or from the contaminated fingers of mother or nurse, during the early days of life.

An important phase of the disease is the vaginal infection of little girls, usually transmitted by the hands of the mother or nurse. This is a particularly distressing condition, for it is difficult to cure and may leave a girl sterile, or with pelvic disease, for life. Hospitals for children must be constantly on the alert for this affection, for it is easily carried on the hands of a nurse and has been known to spread rapidly through an institution by this means.[1]

**Diagnosis.**—There is but one definite method of making a final diagnosis—the microscopic examination of a stained smear of pus. With a history of exposure and a purulent discharge from the male urethra, developing within two or three days, a physician should always make a tentative diagnosis of gonorrhea, in the absence of a microscope. Without the latter, it would be extremely difficult to make a positive diagnosis in a woman. If confirmation of a diagnosis is desired, culture of the organism and a complement fixation test of the patient's blood serum should be the final resort.

**Mortality.**—Gonorrhea sometimes kills by a septicemia or meningitis. Its greatest mortality, however, is from complications, such as a heart disease or a female pelvic invasion necessitating operation. But we have seen many a woman who lived and begged for death as a welcome relief from suffering of mind and body. And many a man has endured a living death by reason of the realization that his home was childless, and his wife a pain-wracked invalid, through his own folly.

## SYPHILIS

In his introduction to the discussion of syphilis in "Today's World Problem in Disease Prevention," Dr. John H. Stokes, of the Mayo Clinic, has the following to say:

[1] See Chapin, Sources and Modes of Infection, p. 165.

"Syphilis, like gonorrhea, is an infection caused by a specific and definite germ. It is a master disease, the peer, and indeed the superior of tuberculosis, the great 'white plague,' in the wide range of its influence over the fate of mankind, present and future. There is not a tissue or a structure of the body which syphilis cannot affect, nor is there an aspect of the entire science of medicine in which it will not be encountered. . . . No lane is so long that one may not find syphilis at its turning. The disease has changed the destiny of mankind upon the earth. If it should cease at this moment to be transmitted, its effects would not disappear from the world within two and perhaps three generations. Few indeed of living human beings can boast an ancestry free from its remote effects.

" . . . Infinitely clever, infinitely versatile, even a little inclined to chivalry in that the disease is in general less severe in women than in men, syphilis is an opponent worthy of the subtlest resource, the most indomitable determination. The seeming triviality of its onset, its extraordinary skill as a dissembler, the silent but none the less terrible march of the invading host of spiral germs from their point of invasion through the blood to every structure of the body, the long years of silent, evil and yet wonderfully skillful work they do under an outward aspect of good health, the variety of ailments to which syphilis can give rise, and yet the dramatic, the almost astounding effectiveness of proper treatment, make it decidedly unique. . . . To the appreciation of its course and its history it is not amiss to bring a little of the spirit of the artist, in order to understand the workings of this masterpiece of evil, this most gifted of all the unholy fellowship of devil's aides."

Thus is expressed the sentiment of one who has had an unusually wide and varied experience with the disease. To give the subject anything like an adequate presentation would be beyond the scope of this book. Suffice it to say that the above characterization is well within the limits of verity, when we consider the host about us of tabetics, insane, imbecilic, crippled, deformed, invalided women and horribly disfigured men, who have been brought to their pitiful condition by syphilis. And there must be added to their number that unseen host of children stillborn, or dead from premature birth or from the early ravages of hereditary infection.

**Infective Agent.**—*Spironema pallidum* is the infective agent. Formerly it was designated *spirochaeta pallida*, then by later investigators the term *treponema pallidum* was preferred. It is a long, corkscrew-shaped, actively motile organism that is difficult to stain and to cultivate in ordinary media. Researches published in 1920, under the auspices of the Interdepartmental Social Hygiene Board, have given us a method of staining[1] and one of anaerobic cultivation that appear to be quite promising and more easily applied than the older procedures.

**Incubation Period.**—From one week to one month may be required for the initial sore to develop from an infection.

**Immunity.**—There is practically no natural immunity to the disease. All ages are susceptible, from the unborn infant to the senile. A second fresh infection is not usually acquired while the disease is present, but recently, reports have been made of cases in which a second infection had followed a cure with the newer remedies.

**Modes of Transmission.**—Perhaps the greatest number of cases arise through sexual intercourse. Again it should be emphasized that women are often innocently infected

[1] Rosenberger and Franz developed methods for staining the organism, while still moist on the slide. One process employs aniline black and the other dahlia. The latter is a so-called "vital" stain, combining with the living cell and killing it as an increasing amount of the dye is absorbed.

by their husbands. Dr. Stokes, who was quoted above, estimates that 50 per cent. of female patients are so infected. Men sometimes receive it from their wives.

Extra-genital infections may occur on any part of the body. The lips and mouth are common sites and usually receive the germs from a person having ulcers in the mouth, or from some article which such a person has recently had in his mouth. Clothing *freshly* soiled with exudate from a lesion that bears the spirochaete may transmit infection.

Considering the great frailty of the organism outside the body, and its lack of resistance to drying and to soap suds, there is little likelihood of infection from doorknobs, toilet seats and such articles. Only in the case of very fresh contamination would it be remotely possible to acquire the disease from these things.

What is perhaps its most striking characteristic is the hereditary transmission of syphilis. Some indeed believe this to be its most frequent mode of transmission. At any time during the intrauterine life of the child it may become infected from its mother. Formerly it was thought that the infection might be acquired directly from the father, without the mother partaking of the disease at all. But later studies have demonstrated this to be an error, due largely to the difficulty of recognizing an initial lesion high in the vagina, to the more benign course often pursued by the disease in the infected woman, and to lack of proper technic in making blood tests. Growing out of this fallacy was Colle's law, which taught that a syphilitic child might nurse from a healthy mother without giving her the disease. We know that the reason the mother showed no signs of syphilitic chancre on the nipple was because she already had an infection.

**Diagnosis.**—Many persons developing the late manifestations of syphilis have been the victims of faulty diagnosis at the time that the chancre first appeared. Let us repeat here what was said of chancroid, that the more experience a physician has with the two diseases the less is he willing to risk a diagnosis upon the appearance of the sore. With the dark field method available to anyone who will take the slightest trouble to procure inexpensive equipment, no physician does his duty by a patient if he does not use it. At the time of the initial sore syphilis is nearly always LOCAL. When the secondary symptoms have appeared it is SYSTEMIC. While local, it is amenable to abortive treatment. A few days later it is not. The difference between the two means years of treatment and may make the difference between *cure* and *arrest* of the disease. Therefore, USE THE DARK FIELD EARLY AND OFTEN. Further, *do not treat the chancre* at all until diagnosis is made. One local application of the mildest sort may drive all spirochaetes deep into the tissues. A recently developed staining method, mentioned above, may also prove of value in early diagnosis.

Once the infection has invaded the body another method of diagnosis becomes available, viz., the Wassermann test. To discuss its uses and interpretations here would completely fill the limits of this book.

The physician must interpret reports upon Wassermanns in the light of all the data which he may have in regard to his patient's history and symptoms. It is of particular importance to note that a SINGLE NEGATIVE WASSERMANN GENERALLY MEANS NOTHING. Repeat again and again, if negative, and if the history or clinical symptoms warrant a suspicion of such infection. On the other hand, a doubtful or one-plus Wassermann may not mean syphilis.

A refinement of the Wassermann test is that done upon the spinal fluid. This may frequently show disease of the central nervous system when the blood is persistently negative.

A further test which reveals the beginnings of those most terrible of all the late syphilitic manifestations, paralysis of the insane and locomotor ataxia, is the colloidal gold test done on the spinal fluid. In the hands of an expert it gives quite uniform results and is invaluable to the patient, as it may mean the one chance of rescue from insanity and paralysis.

Since syphilis is so protean in its manifestations, it may be necessary to differentiate it from almost any other disease to which flesh is heir. And by reason of this fact, an underlying syphilis may be suspected in any condition that cannot be readily explained by other causes.

**Mortality.**—In ages past, syphilis was an acutely fatal disease, destroying its victims in a few weeks. Time has conferred some degree of resistance upon the race, so that we rarely see such cases today. But the rapidly fatal termination would often be a boon to those who must die by inches from paresis, from tabes, from organic involvement, or from congenital debility. Taking these late developments of the disease into consideration, we may say that the mortality of untreated syphilis is high.

**Early diagnosis and thorough treatment mark the way of salvation for the syphilitic.**

## 40. THE CONTROL OF VENEREAL DISEASES

"Venereal diseases have at last been recognized as prevalent, destructive and preventable. They have been brought into the open and they cannot stand the light." Thus Wilbur A. Sawyer, M.D., formerly Major, M.C., U.S.A., sums up the present attitude toward what was but recently regarded as impossible. We have already seen that these diseases are more widely prevalent than any of the communicable diseases. That they are terrible in their destructiveness has been demonstrated. It remains for us to study the methods by which they may be controlled.

At the outset it would be well to recall that these infections are similar in all respects to other communicable conditions. We know their sources, and the causative organisms. We know that they are transmitted by contact direct or indirect. Indeed we are in a better position in respect of these affections than with many others that have been controlled effectively. But long accepted convention had set up a barrier of silence about them, and had created public conviction to the effect that nothing could be done to control them. As a convincing refutation of this opinion, the plans outlined in this chapter are presented, not as theories, but as things that have actually been put into successful practice in this country during the last five years.

Every study of the source of venereal infection leads ultimately to the prostitute, whether commercial or amateur. The hereditary syphilis of the babe traces its origin directly through innocent mother, through father to prostitute. Gonorrheal ophthalmia in the new born follows the same route. On the face of it, then, the solution looks simple—no more prostitutes, no more venereal infection. But a little study of the *business* of prostitution will show that such is not the case.

To the average person it comes as a startling revelation that prostitution is a well organized and widespread business. An examination of the voluminous report of the Bureau of Social Hygiene of New York, published under the title "Commercialized Prostitution in New York," is enlightening on this point. The Bureau employed trained investigators who spent a year working on the subject, in intimate, daily contact with those whom they were studying. They passed themselves off as persons who were in the business and thereby learned the most minute details. As a result they secured a mass of reliable information.

For a period of months these investigators counted every woman whom they found in a house of prostitution and arrived at the total of 14,926. These figures were for the regular houses alone and did not include those who frequented hotels, lodging houses and all the others of the group commonly designated "clandestine." The investigators found 15 to 25 women to each house. Moreover, they estimated that at least $2,000,000 had been paid to women in these houses in one year.

But such a tremendous business as this does not "just grow." The women engaged in it are the employees of men and women higher up, for the most part. As any other business man would do, this group of vultures deliberately fosters "trade" by the use of every artifice that would tend to incite susceptible men. Furthermore, they are constantly on the lookout for new recruits in their houses, and this is one of the blackest pages of their history. For only in the rare instance does a woman deliberately choose the life. She is usually the victim of our vicious "conspiracy of silence" which denies the innocent girl any wholesome instruction on the subject of sex, and then casts her out as a moral leper when she has fallen a victim to those things that she knew nothing of. Many of these girls are below par mentally, some of them actually feeble minded, incapable of making wise moral decisions and fit only for institutional care. In California 30 per cent. were found to be such by careful psychological analyses.

That a business of this magnitude will not die easily is self-evident. Those who derive the larger incomes from it are well organized and have entrenched themselves in some governing bodies. It is from them and their political henchmen that we hear reiterated the old platitudes that men always have and always will demand prostitutes. And it is through their subtle machinations that many an effort to curb the evil has come to naught.

Every woman who gives herself to promiscuous relations is a potential source of infection. What then, are the figures as to disease among such? The New York report, above referred to, throws interesting light upon this question. Of 466 women examined at the Bedford Reformatory, only 50, or 10.7 per cent. were entirely free of infection as shown by complement fixation tests. Not all of these women were from houses of prostitution, but all were of the sort who would consent frequently to illicit relations. Among other things the figures illustrate the fallacy of many a young man's argument that he cannot contract disease because he is very careful as to whom he chooses as a partner, and never enters a regular house.

Bearing these figures in mind, let us look at the number of possible exposures to infection. One New York investigator found a woman in one house whose card bore 30 punch marks, indicating that she had as many visitors in one night. In Chicago, the Vice Commission observed one house for 22 months. In that time there was an average of 18 inmates who had 15 visits each per night. The New York Bureau estimated, from their figures, 150,000 exposures per day. The wonder is that we do not see a greater amount of infection.

Thus hastily have we surveyed the problem of commercial prostitution. What is to be done about it? At the beginning of the World War Surgeon-General Gorgas said that if he could choose between eliminating all battle wounds and all venereal infection, he would choose the latter, for he realized their direful consequences to the nation, to the Army and to the individual. Past history had taught him that these diseases were far more destructive to manpower than the enemy's fire. Out of the realization that our soldiers must be protected as far as possible from such infection grew the American plan for the control of venereal diseases. This plan has been accepted as a model for the world and has been studied by representatives of many foreign countries.

The prime essential of this plan is the suppression of prostitution. No compromise is made, but the business is eliminated as completely as possible. This calls for complete cooperation on the part of local officials, backed by laws with adequate penalties and no loopholes. Such a policy has been adopted by many states as a whole. Houses are closed; personal and real property used for such purposes is seized; the women and their employers are placed in detention homes or jails; and the men who are found associated with them are treated upon the same basis as the women. This latter is an advanced step. To treat the male offender exactly as the female is treated is an innovation, but one that is in all respects just.

In many states the procedure followed with both men and women, who are arrested under the laws controlling prostitution, is for the court to hand them over to the health authorities, who, while holding them under quarantine, examine and treat them. When they are found to be no longer infective, they are returned to the jurisdiction of the court for sentence. In other states treatment and sentence run concurrently. This latter method is not satisfactory, as the jail term does not usually allow time to render the prisoner non-infective. Besides, it is essential to keep clearly differentiated in our minds the isolation because of infection with communicable disease, and jail detention as a punishment for moral turpitude.

Another logical procedure is the attempt to rehabilitate the women, so far as possible, by giving them vocational training whereby they may support themselves decently, after release. Those who are not capable of acquiring such training are held permanently in detention homes or farms, where they can no longer be a menace to society. Obviously, to drive the prostitutes out of a town, without making any provision for their care, is merely to sweep the trash from one's own yard into one's neighbor's. To be effective, the plan must be worked as a whole. And it is encouraging to note that many states are doing all of these things successfully. Space will not permit of more than this bare enumeration of activities, but details may be secured from the U. S. Public Health Service.

That the plan is worth its cost can hardly be gainsaid. Every prostitute isolated and rendered non-infective reduces exposure to that extent. Infection prevented, especially syphilitic, will have its effect far beyond the immediate generation. Growing boys and girls will no longer see immorality publicly flaunted and openly connived at.

Several objections to the plan are usually offered and should be answered. The first one generally heard is that men will seek clandestine modes of satisfaction, if deprived of public prostitutes. We must admit that an appetite equally as fundamental as that for food is not easily controlled. But it is the practice of the professional prostitute and her employers deliberately to present temptation and to arouse dormant passion by every device known, in order to increase business. Artificial stimulation of this sort will be removed. The knowledge that satisfaction is not so easily had will restrain desire to a certain extent.

A closely allied proposal is that prostitutes should be segregated in a designated district and periodically examined for the presence of infection. Many investigations have been made of women who have been thus examined, and they have been repeatedly found to be harboring infection. It could hardly be otherwise when we consider the immense amount of male infection and the number of times that a woman may be exposed in a single day. A report on a certain city, from federal workers, states that 40 certificates of freedom from infection were taken from women detained in a hospital because of venereal disease. These certificates had been issued by physicians, some of them in high standing. A man seeing such a certificate exposes himself to infection all the more readily. Part of the program above mentioned is to prohibit the issuance of certificates of this sort entirely.

A further objection raised is that the suppression of professional prostitution does not reach the amateurs, and that these may harbor more virulent infections than the professionals. The amateur, if she causes infection, may be isolated and treated just as effectively as the professional. Though it may not be so easy to locate the former, it can be, and is being, done in some states. The Army, cooperating with civilian authorities, succeeded in isolating many infected amateurs in the vicinity of cantonments, and one of us has isolated infected women of this class in a western state. But, regardless of the virulence of infection or the difficulty of apprehension, it must be borne in mind that the amateur seldom exposes more than one or two males in a week, while the regular prostitute exposes many every night. The difference in number of exposures counts heavily in the spread of infection.

Many other objections are made, some of them sincere, but more, by far, emanating from those who profit in the business. That none of them is sound has been demonstrated by the fact that the plan as outlined *works*.

We must admit that fear of consequences or a cold idealism alone will not deter many from exposing themselves to infection. As Dr. Stokes points out in his admirable book, there must be a moral bulwark built upon proper education of the young, coupled with active physical development and high ideals.

Parents must teach their children the fundamentals of sex from the time the first questions are asked. In this enlightened day a grave responsibility rests upon those who allow their boys and girls to grow up without such instruction. The fond delusion exists that *their* children are ignorant and therefore innocent. All who have to deal with children in schools and elsewhere know that this is not true. Any adult can remember the vileness of things he heard in school and at play. Yet the average adult will blindly believe that his child is not absorbing the same sort of thing. Is it not better to teach the child correctly and fully in the beginning, than to have him secure his sex knowledge only from obscene associates? That he will get it somehow no one can be gullible enough to deny. For those who are in doubt as how best to present the subject to their children, many helpful books and pamphlets have been prepared by various social agencies, among them the American Social Hygiene Association, 370 7th. Ave., New York, N. Y.

Education begun at home should be carried on in the schools. Courses in physiology, biology and hygiene can make the subject of sex clear and at the same time present it without arousing self-consciousness. The reproductive function can be shown in its true relationship as a part of the natural growth of the body, necessary to physical and mental development. Thus a sound foundation can be laid for a superstructure of ethical ideas. Cooperation of the church, of social agencies and of the state should be had in this educational campaign, in order that all may be reached and that the lesson may become indelibly impressed upon minds in their most receptive period. The ideals of love, marriage, homemaking and parenthood should be held before older boys and girls as the highest expression of their sexual endowment, which should be protected from all things that would ruin the home or produce defective offspring. That such an appeal makes a deep impression upon boys of high school age has been amply demonstrated during the showing of "Keeping Fit" exhibits in all parts of the country. This educational campaign is under way at the present time, on a stupendous scale, and we may hope to see the coming generation entering upon the experiences of life with its eyes open.

However, even the best education will not always save a boy or girl from exposure to infection. Healthy bodies must have expression in one way or another. A part of the coordinated movement against venereal disease is that which is fostering more opportunities for wholesome play, for recreation that "blows off steam," and that directs the mind into constructive channels, leaving no time or thought for sexual irregularities. Such provision is needful for the thousands of young men and women who go to our cities to make their way and who are forced to live in cheap boarding houses, often friendless and homesick, an easy prey to designing persons of the opposite sex. This was pointed out particularly by the New York investigators, but is true for all other cities. Equally urgent is the need of the small town and rural community.

Medical prophylaxis and treatment are important phases of control, but are only makeshifts in the absence of "moral and educational prophylaxis." Medical prophylaxis has been used in the Army and Navy for sometime. However to be successful it is necessary that the man be willing to present himself for treatment within as short a time as possible after exposure. Figures from official reports indicate that infection is materially reduced where such is the case, but that the infection rate rises in direct ratio to the length of time elapsing between exposure and treatment.

Treatment of the developed case in the infectious stage is necessary as a public health measure, in order to render the patient non-infective as rapidly as possible. This is particularly successful in syphilis, where one dose of arsphenamine will frequently accomplish the desired result. However, treatment until cured is essential in order to avert hereditary transmission of syphilis and to render a gonorrheic safe to his family.

Unfortunately, there is too little appreciation on the part of the medical profession of the necessity for continued treatment. There is a tendency among some doctors to get all the money that can be squeezed from such a patient, which acts as a deterrent to proper treatment. Most victims of venereal infection are young men and women who can ill afford to pay high fees for long courses of medication, such as are essential to cure. When their money is gone they cease to call upon the physician, especially when there are no objective signs of disease. The profession can do much to diminish venereal infections by carefully studying modern methods of treatment, and by placing their fees within reasonable limits.

On the other hand, ignorance leads many a patient to drop his treatment as soon as he can see no further signs of infection. Education, continuous and widespread, will remove this misunderstanding. Here again the physician can do much by making use of the literature that is readily available. Many states require that every physician treating a case of venereal infection shall hand to his patient the literature provided by the state department of health.

For those who cannot pay medical fees, free clinics should be provided. The growth of such centers, many of them receiving federal aid, is phenomenal.

The patient himself should be under control of the health authorities, as would any other suffering with an infectious disease. In the case of venereal conditions, treatment renders the patient fairly safe to the public. So long as he continues treatment until cured, he is allowed to go about his business, in the majority of states. If, however, he fails to report to his physician for a given period, and the physician has received no word of his employing another, the practice in many states is to require the physician last treating the case to report the patient's name to the health authorities. The latter are then expected to find the patient and place him under restraint, if necessary, until cured. In most states public opinion is not sufficiently enlightened to permit of reporting all venereal disease cases by name, as yet. It is hoped that the day is fast approaching when this will no longer be true.

It hardly seems necessary to add that concurrent disinfection of all discharges and of articles soiled therewith must be practiced at all times. This is particularly necessary for doctors and nurses attending venereal disease cases.

To sum up, then, let us bear in mind the principal points that have been made regarding the control of venereal infection:

1. Suppression of prostitution
2. A single standard of morals for men and women
3. Education of young and old upon the real meaning of the sex function and upon its protection
4. The setting of high ideals of love, marriage and parenthood
5. Provision for wholesome recreation
6. Early and continuous treatment of the infected
7. Control of the patient.

In conclusion, let it be urged that we approach the subject with open minds. Let neither prudish pharisaism nor maudlin sentimentality unbalance our thinking. We are faced with a "condition, not a theory." Let us give it the best we have of calm, reasoned, scientific analysis.

## 41. WHOOPING COUGH

Whooping cough takes rank second only to diphtheria as a cause of death from the communicable diseases, thereby refuting once more the popular fallacy that the so-called "diseases of childhood" are harmless and should be acquired early.

**Infective Agent.**—The Bordet-Gengou bacillus, or *B. pertussis*, has been indicted and proved guilty of producing this disease. It is found in immense numbers in the secretions of the bronchial tubes, particularly during the early stages of the infection.

**Immunity.**—There is no natural immunity to whooping cough, although many observers believe a relative immunity exists during the first six months of life. Second attacks are quite rare. The results of prophylactic vaccination have been encouraging enough to warrant further tests on a larger scale and with heavier dosage. At least twice the ordinary dose should be used.

**Incubation Period.**—Owing to the indefiniteness of early symptoms it has been difficult to determine the incubation period with exactness, but experimental evidence tends to place it at two weeks.

**Modes of Transmission.**—Droplet infection doubtless plays the chief role in spreading whooping cough. In the early stage, when the bacteria are most numerous in the bronchial secretion, the case is most highly infective. So long, however, as the patient carries and distributes the organism, he is more or less dangerous. This may continue for several weeks after the beginning of the spasmodic stage.

As in measles, the difficulty of diagnosing a case in the early catarrhal stage contributes to its dissemination. Moreover, there are many mild cases, among adults particularly, that are missed entirely and become foci of infection.

Articles and hands soiled with the secretions may occasionally transfer the infection and it can be spread by kissing.

**Diagnosis.**—The course of the disease is roughly divided into two stages—catarrhal and spasmodic. To distinguish the former from other inflammatory processes of the respiratory tract is impossible, although such symptoms occurring in the presence of an outbreak of the disease should arouse suspicion and justify a provisional isolation.

After a week or 10 days, the second stage develops, which is characterized by more or less frequent paroxysms, in which the patient continues to cough until breathless and ends the spell with a "crowing" inspiration. Vomiting may follow. The peculiar whoop is practically pathognomonic and, taken together with other symptoms, clinches the diagnosis.

**Methods of Control.**—Promptly upon the development of suspicious symptoms, the patient should be isolated strictly, until the spasmodic stage is reached. For at least four weeks from that point, he should be excluded from contact with non-immunes and from frequenting places of public gathering.

Concurrent disinfection of all discharges from the nose and mouth should be practiced, not overlooking the vomitus.

Non-immune contacts must be quarantined for 14 days from last exposure and pet animals must be excluded, as they sometimes contract the disease.

When a case develops in school, all children should be watched for early signs, resembling a common cold. Immediately upon the appearance of symptoms in a child he should be excluded, until sufficient time has elapsed for the spasmodic cough to develop.

**Mortality.**—Emphasis must be laid upon the high mortality of whooping cough. Including sequelae, over one-fourth of all cases are fatal. This is partly due to the fact that many cases of tuberculosis in children are traceable to a prior attack of whooping cough. Sudden deaths from rupture of the heart and from cerebral hemorrhage are also quite common, in addition to complicating pneumonias.

A feature of considerable significance, in this connection, is the fact that deaths occur more frequently among the younger victims of the infection, between the ages of six months and five years. *Delaying the age incidence,* therefore, will materially reduce mortality and should be the principal aim of the health officer.

## 42. YELLOW FEVER

While yellow fever is unknown in the United States, at present, extensive outbreaks have occurred within quite recent times and its absence is wholly due to the watchfulness of our quarantine authorities. To the south of us are many foci of the disease that are a constant menace to our shores.

The control of this terror of the tropics is a monument to the heroism of a U. S. Army Commission composed of Reed, Carroll, Agramonte and Lazear. For these men risked their lives to prove the mode of transmission of the disease, by many attempts, and finally acquired the infection in the only way that it can be transmitted. One paid the supreme penalty as the result of his devotion to science.

**Infective Agent.**—The specific organism has been supposed to be a filterable virus. Recently, however, Noguchi appears to have isolated and identified it as a spirochaetal organism, the *Leptospira icteroides*. It will be interesting to note the further progress of his work in the near future.

**Incubation Period.**—The period of incubation in man is five days.

**Immunity.**—No natural immunity to yellow fever exists. Immunity for life is conferred by an attack of the disease. Children often suffer only lightly from the infection, which may even go unrecognized in them.

**Modes of Transmission.**—Like malaria, the transmission of yellow fever depends entirely upon a mosquito. In this case *aedes calopus* is the culprit. This mosquito has alternating bands of black and white upon the legs; bites usually in the late afternoon, and is found almost entirely in the immediate vicinity of houses. Again the female is the vector of infection.

Certain points established by the Army Commission should be noted.

1. The blood of a yellow fever patient contains the infective agent for only three days after symptoms develop.
2. When this blood is ingested by a mosquito, 12 days must elapse before another person can be infected.
3. The mosquito remains infective for life, which is at least three months.
4. The discharges of the patient are absolutely harmless.

**Diagnosis.**—An isolated case of yellow fever may be difficult to diagnose. Bloody vomit and diarrhea, jaundice and profound prostration are salient features. When other cases in the neighborhood of an infected individual are found and *Aedes calopus* is present, diagnosis becomes easier.

**Methods of Control.**—Control depends upon the screening of the patient against mosquitoes and the eradication of the insects. In the case of yellow fever this is much simpler than with malaria, for the breeding places are right at hand and are not usually extensive. The same methods of drainage, filling, screening, oiling and the use of minnows apply.

Further than preventing the entrance of mosquitoes in the sick room, for three days, no other precautions are necessary in the control of the patient.

**Mortality.**—The mortality of yellow fever is high, 25 to 30 per cent of cases dying. But we have a constant demonstration in many civilized countries that the mortality may be nil, if preventive measures are scientifically applied.

# PART III

# APPENDIX

# APPENDIX I

## PLAN OF COUNTY HEALTH WORK

The following plan has been devised primarily for county health officers in order that they may so arrange for the carrying out of the details of their work as to give the most satisfactory results for the expenditure of funds and time available.

1. **Education.**

One of the primary duties of the local health department is to educate the people of the community as to the causes and prevention of the spread of communicable diseases, and as to the possibilities for community health improvement. In the attainment of this object, the health officer should

(a) Provide a number of carefully considered addresses, using, where desirable, illustrations with lantern slides, charts and models and films.

(b) Furnish to the people, with the aid of the state health agency and other public health agencies, such educational material in the form of folders, pamphlets, bulletins, etc., as will prove of value in emphasizing the importance of health conservation.

(c) Arrange, through the local press, for the publication of suitable news items and educational material relating to the work of the health department.

(d) Give at community fairs and public schools, and at such other places as may be practicable, suitable public health lectures and exhibits.

(e) Inform the people, especially teachers and school children, as to the health laws and regulations and the necessity therefor.

(f) Make use of all other educational measures available for interesting and informing the people as to the importance of public health protection.

In the execution of the above plans, the health officer should enlist the support and cooperation of all available organizations and agencies.

2. **Control of Communicable Diseases.**

(a) Stimulate the prompt and complete reporting of cases of notifiable diseases on the part of physicians and the general public, through education, checking of newspaper notices, and investigation of verbal reports of suspected cases. Report card forms may be placed in convenient places within the county, especially in the schools. Special emphasis should be laid upon the reporting of *suspected* cases.

(b) Visit, in person or by agent, homes, schools and communities, for epidemiological investigations, and the establishment of measures for the control of cases or suspected cases, or of outbreaks of communicable disease.

(c) Keep a spot map showing the current prevalence of communicable diseases.

(d) Make such laboratory examinations for the protection of the public health, and for the diagnosis of communicable diseases, as may be requested, and maintain laboratory facilities, or a supply of shipping cases for specimens, supplied by the state public health laboratory for this purpose.

(e) Consult with attending physicians relative to cases of communicable disease when requested, or wherever there may be difference of opinion as to the diagnosis of cases or suspected cases of communicable disease.

(f) Arrange for free clinics as far as practicable, for the diagnosis of communicable diseases, and for the treatment of venereal diseases. (With the possible exception of venereal diseases, cases of communicable disease found should be referred to the family physician, or if unable to pay, to the city or county physician.) The health officer should avail himself of the voluntary services of physicians and others, where necessary, for the organization of such clinics.

(g) Arrange to meet the people of the county, in the office of the health department or in publicly announced dispensaries at other places, for the purpose of administering vaccines or other protective biological products of established value.

(h) Vaccinate, or supervise the vaccination, against smallpox, of all school children, or other children whose parents may request such vaccination.

(i) Maintain a suitable supply, under proper conditions, of vaccines and anitoxins for use in emergency.

(j) Report cases of notifiable disease promptly to the state health agency.

3. **Excreta Disposal.**

(a) Make, or cause to be made, an inspection of every home in the county, for the purpose of ascertaining the status of excreta disposal conditions and improving such conditions where necessary. Such work should be carried on in the more thickly settled communities first. In the rural sections, advice and persuasion should constitute the primary method of procedure. In incorporated villages, towns and cities the health officer should endeavor to secure suitable ordinances requiring the sanitary disposal of excreta, and to see that the provisions of such ordinances are carried out.

(b) Prevent the pollution of streams.

(c) Problems of municipal sewerage and sewage disposal should be referred by the county health officer to the state health agency for advice and instructions, where any expenditure of municipal funds is involved, before taking any action.

4. **Water Supplies.**

(a) Make such inspections and laboratory examinations as may be necessary to keep informed as to the safety for consumption of all public water supplies.

(b) Make, or cause to be made, an inspection of every private water supply within the county, and endeavor to secure, primarily through advice and persuasion, such improvements as may be necessary to make such water supplies safe for consumption.

(c) Problems of municipal water supply involving an expenditure of municipal funds should be referred by the county health officer to the state health agency before taking any action.

5. **General Sanitation.**

(a) Advise the authorities of cities, towns and villages as to the most suitable methods of collection and disposal of manure, garbage and other wastes, and endeavor to secure proper ordinances for the regulation of the disposal of such wastes. The health officer should confer with the state health agency before making any recommendations as to municipal wastes collection or disposal.

(b) Advise householders in the rural sections as to the best methods of the disposal of wastes, as to screening, and as to the elimination of fly and mosquito-breeding places.

(c) Inspect, or cause to be inspected, all public buildings, courthouses, city halls and jails, and advise the local governing authorities as to needs for sanitary improvement.

(d) Inspect, or cause to be inspected, all public and private school buildings as often as may be necessary and advise the authorities of public and private schools as to sanitary improvements needed in school buildings.

(e) The health officer should enforce regulations or laws prohibiting common drinking cups and common towels, giving especial attention to public buildings, schools, hotels and restaurants.

(f) The health officer should enforce regulations or laws governing the sanitation of swimming pools, labor camps, public camp grounds, sanitation of public buildings, etc.

(g) In counties where there are National Forests, the health officer should cooperate with the Forest Supervisor and the Forest Rangers in the enforcement of sanitary regulations, especially on recreation areas.

6. **Child Hygiene.**

Where there are one or more public health nurses on the staff, the work to be carried on under this heading should consist of the following.

(a) The organization and instruction, by lectures and demonstrations, of mothers' clubs and other groups of people in the essentials of home sanitation, prenatal and post-natal care, and especially in the feeding of infants, in accordance with a course of lectures approved by the state health agency. In connection with these clubs, there should be made, in accordance with forms and instructions approved by the state health agency, physical examinations and records of the children of the community who are brought in by their mothers for examination and advice. In this way, mothers' clubs will be utilized to develop a more intelligent and closer oversight of children by parents.

(b) The keeping, where practicable, of a tack map of the county showing:

1. breast-fed children,
2. bottle-fed children,
3. children under two years of age suffering from digestive disturbances or diarrheal diseases.

(c) Visits and conferences with parents in as many homes as possible where there are "2" and "3" in (b) above.

(d) Provision at the office at the county seat, and at other appointed places, for conference with expectant mothers. These conferences may embrace, among other things, the simpler tests of urinary analysis and pelvimetric measurements, where practicable. Any important information elicited in these conferences shall be reported on regularly prescribed forms, with the permission of the expectant mother, to the family physician.

(e) The organization and instruction of the midwives of the county, in such a way as to make the employment of midwives for obstetrical cases as safe as possible, and to insure prompt and accurate reporting of births by them.

(f) Class instruction of midwives by a public health nurse, and individual instruction where advisable.

(g) Enforcement of regulations or laws governing the practice of midwifery.

(h) Enforcement of regulations or laws governing the prevention of infant blindness, and where funds are available, the supplying of free prophylactic (1% silver nitrate or an equivalent) to midwives, with instructions as to use.

(i) Cooperation with school authorities, as far as is practicable, in the medical inspection and correction of defects of school children.

Where such a plan is agreeable to both parties, it should be arranged with such authorities that the carrying out of the details of the work be placed under the supervision of the health officer. Under such an arrangement, where school nurses are available, all routine examinations are made by the nurses, such special examinations as may be needed being made by the health officer. No physical examination of any child should be made by the health officer, or by any nurse under his direction, where the parents object to such examination. Records of examinations should be kept on standard cards meeting with the approval of the state department of education and the state health agency. Parents should be notified in writing of defects found, and all cases should be referred, through the parents, to the family physician. As rapidly as possible, the nurses should follow-up defective children, for the purpose of ascertaining whether corrections have been made and urging attention to defects which have not been remedied, unless the physician consulted by the family has advised otherwise. No attempt should be made, under any circumstances, to *force* the correction of defects. If the defects have not been remedied as a result of poverty, such cases should be referred to the city or county physician, or to a free clinic, if available. No case should be referred directly to any particular physician.

(j) The organizing of free clinics, where possible, through the voluntary cooperation of local physicians and dentists, for the correction of defects among indigent children.

7. **Sanitation of Foods.**

(a) Inspection of food-handling establishments and enforcement of adequate food sanitation regulations or laws.

(b) The inspection and scoring of dairies and of milk-handling establishments, and bacteriological examinations of milk samples.

8. **Reports of Births and Deaths.**

(a) Receive reports of births and deaths; in some states, issue burial and removal permits, and file reports with the state health agency, in accordance with local practice.

(b) Arrange for sub-registrars at convenient places outside of the county seat; instruct them in their duties, and maintain adequate supervision over their work, if such is required by state law or regulation.

9. **General Administration.**

All assistants should work under the direction of the health officer and perform such duties as he may assign.

Travel should be done by automobile, except where such conveyance is unnecessary in cities, or where impracticable. The cars should generally be provided by the employees and operating expenses be allowed. Expenditures of funds should be made by the health officer strictly in accordance with the approved budget, and strict account should be kept of all expenditures incurred, each item under its proper heading as outlined in the budget.

10. **Reports.**

Each health officer should prepare reports as follows:

(a) A diary, giving résumé of work of each day (for record only).

(b) Monthly reports, not later than the 5th day of the succeeding month, for presentation to the local governing board.

(c) Yearly reports, not later than the first day of February of the succeeding year.

Monthly reports should be made on standardized statistical forms, and should include financial reports of the month's expenditures, and a brief narrative report of the most important events.

Special reports should be prepared as occasion demands.

11. **Cooperation with Other Agencies.**

The health officer should enlist the aid of all other agencies available, in carrying out his work, with special reference to city and county school authorities, home demonstration agents and county agricultural agents, supervisors and rangers of the Forest Service, the local chapter of the Red Cross, Women's Clubs, Men's clubs, and other organizations.

The county health officer should endeavor to secure full cooperation on the part of the physicians of his county, by keeping them informed as to the progress of his work and by consulting with them freely upon all matters in which they may have a special interest. This should be done with the physicians as individuals and as a county medical society. The county health officer should be especially careful in the observance of the usual professional courtesies. He should keep constantly before the profession their peculiar duties as public servants, particularly in respect of making reports and other requirements of law or regulation. Such a spirit of cooperation should be fostered that a physician delinquent in these matters will be condemned by the united opinion of his professional colleagues.

# APPENDIX II

## A FORM OF STATISTICAL REPORT FOR LOCAL HEALTH OFFICERS

The following report form has been in use, in one state, for about three years, and has been found quite satisfactory. It is made up on sheets $8\frac{1}{2} \times 11$ in size. The same form can be used for summarizing the quarterly and annual statistical reports.

Another state uses a more elaborate form than this, on which equivalent money values are given for each item. For instance, a visit to a case of communicable disease would be valued at one dollar, while the health officer, or nurse, would also be allowed a small amount for mileage. The total of these values really represents a score for the month's work, which can be readily compared with that for other counties. There are, of course, flaws in any system of scoring, but it is useful for purposes of comparison, and also for making tangible to the public at least part of the value of the health department's activities. A ot any one can grasp a money value, even though he cannot visualize the same thing in terms of lives saved, or disease prevented. It is necessary in such a system that the public shall be convinced of the reasonableness of the equivalent values assigned to the items. In fact, they should be most conservative, in order to avoid any possible criticism of being placed too high.

COUNTY OF........................

COUNTY HEALTH OFFICER'S REPORT FOR MONTH OF......19..

(Include report of activities of all persons under your direction)

I. EDUCATIONAL.

1. No. public meetings addressed............Attendance..........
2. No. school talks given...................Attendance..........
3. No. press articles published......... 4. No. office calls.........
5. No. circular letters sent...... 6. No. pamphlets distributed.....

II. COMMUNICABLE DISEASE CONTROL.

1. Inspections for diagnosis......; Control........; Release.........
2. Visits by nurse for communicable disease control.................
3. Smallpox vaccinations: (1) Vaccinias....; (2) Vaccinoids........
   (3) Immunity reactions..........; (4) No results............
4. Typhoid vaccinations: First...........; Second....; Third.......
5. Immunizing antitoxin—Doses...................................
6. Toxin-antitoxin: First........; Second......; Third...........
7. Other prophylactic treatments (state kind and number of each)...

...............................................................

8. Venereal Disease Control Measures:
   Cases investigated: Gonorrhea..........; Syphilis...........
   Cases treated in clinic: Gonorrhea........; Syphilis..........
   Special action on venereal disease cases:......................
   ..............................................................
   ..............................................................
   ..............................................................

CASE RECORD:

| Month | Diphtheria | Measles | Scarlet fever | Smallpox | Tuberculosis | Typhoid | Pertussis |
|---|---|---|---|---|---|---|---|
| Cases on hand beginning of month...... | | | | | | | |
| CASES REPORTED. | | | | | | | |
| Cases released........ | | | | | | | |
| Cases died........... | | | | | | | |
| Cases on hand at end of month.......... | | | | | | | |

III. WATER SUPPLIES.

1. Number of water supplies inspected: urban......; rural.........
2. Number of water supplies unsafe: urban......; rural.........
3. Number of water supplies improved: urban......; rural.........

IV. **PRENATAL, INFANT AND CHILD HYGIENE.**

1. Prenatal instructions given..............................
2. Infant care instructions given: In clinics........; at home........
3. Meetings Mothers' Classes..................Attendance.......
4. Midwives' Classes instructed................Attendance.......
   Midwives inspected and instructed individually...............
5. School children examined (number)..........................
   Total defects found........No. children having defects.........
   Number of children having defects corrected.................
   Number of follow-up visits..................................
6. Schools inspected for sanitation............................
   Violations school sanitation regulations found....; corrected....

V. **EXCRETA DISPOSAL.**

1. Number new privies constructed: urban.......; rural...........
2. Number of privies repaired: urban............; rural...........
3. Number of sewage disposal plants constructed..................
4. Number of school sanitary privies constructed.................
5. Number of sewer connections made.............................

VI. **GENERAL SANITATION.** (Except water, schools, excreta, food.)

1. Number of new inspections..............; reinspections.........
2. Number of complaints investigated............................
3. Number of fly-breeding nuisances abated......................
4. Number of mosquito-breeding places abated....................
5. Number of other nuisances abated.............................

VII. **FOOD SANITATION.**

1. No. inspections (market, store, cafe and soda fountains).........
2. No. violations food san. regulations found.........; abated......
3. No. dairy inspections.......... No. dairies scored.............
   Number scoring above 90....; 81–90....; 71–80....; 61–70.....
4. Number food handlers given physical examination...............
   Number food handlers rejected on physical examination.........

VIII. **LABORATORY.** (Counties having own laboratories will render special report in addition to this report.)

*SPECIMENS SENT TO THE STATE PUBLIC HEALTH LABORATORY*

| | |
|---|---|
| 1. Diphtheria—diagnosis— | positive........negative....... |
| release— | positive........negative ...... |
| 2. Sputum, tuberculosis— | positive........netative........ |
| 3. Widals, typhoid— | positive........negative....... |
| 4. Blood cultures, typhoid— | positive........negative....... |
| 5. Feces and urine, typhoid— | positive........negative....... |
| 6. Smears, gonococcus— | positive........negative....... |
| 7. Wassermann, syphilis— | positive........negative....... |
| 8. Miscellaneous— | |

## IX. ADMINISTRATION.

1. Personnel—Days worked: Health officer........; clerk..........
   Sanitary inspectors..................; nurses................
2. Travel—miles: Health Officer..............; nurses............
   sanitary inspectors.........................................
3. Letters received..................Letters answered............
4. Conferences with county, state or other officials (state person, office, date, place, purpose and decision)

..................................................................

..................................................................

..................................................................

5. Legal actions taken (state cause, court and result)

..................................................................

..................................................................

..................................................................

6. FINANCIAL STATEMENT.

| Item | Budget | Amount on hand first of month | Expense this month | Amount on hand end of month |
|---|---|---|---|---|
| Salary H. O.............. | | | | |
| Salary clerk.............. | | | | |
| Salaries nurses............ | | | | |
| Salaries inspectors......... | | | | |
| Transportation H. O...... | | | | |
| Transportation nurses..... | | | | |
| Transportation inspectors. | | | | |
| Vaccines, antitoxins....... | | | | |
| Laboratory............... | | | | |
| Office expense............ | | | | |
| Miscellaneous expense..... | | | | |
| B & D registration........ | | | | |
| TOTAL BUDGETED.... | | | | |
| Non-budgeted expense..... | | | | |

REMARKS: (Give a brief narrative of important events during the month and of matters not included in the foregoing statistical and financial tabulations, using the reverse hereof, and additional sheets if necessary to make an adequate presentation of the work accomplished.)

Respectfully submitted

.....................

....................19......  ...............................

County Health Officer

# APPENDIX III

## INSTRUCTIONS FOR PUBLIC HEALTH NURSES

The following outline is intended to suggest the kind of work and methods to be pursued by a public health nurse in a small organization. It makes no pretense to completeness, but may help the health officer to formulate a preliminary plan of nursing service. He can best improve upon this plan by taking the nurse into consultation and profiting from her experience.

### I. DIRECTION.

A. When the salary and transportation of the nurse are paid entirely from county or municipal health funds, she shall work entirely under the direction of the health officer.

B. When the salary and transportation of the nurse are paid in part by other local funds, the agencies furnishing these funds may be proportionately represented on a local nursing committee, of which the health officer shall be a member, and this committee may direct the nursing service. In case Red Cross funds are contributed for public health nursing service, it is obligatory that a nursing committee be organized.

### II. REPORTS.

A. When the nurse's salary and transportation are paid in full by county or municipal health funds, the nurse shall submit to the health officer monthly reports in duplicate, on approved forms. One of these reports shall be retained by the county health officer and the other sent to the state agency supervising public health nurses.

B. When the nurse's salary and transportation are paid in part by local funds, other than Red Cross funds, the monthly report form shall be made out in duplicate, one copy given to the chairman of the nursing committee, if there be one, and the other sent to the state agency supervising public health nursing.

C. When the nurse's salary and transportation are paid in whole, or in part, by local Red Cross chapter funds, the nurse shall submit monthly report forms to the Red Cross, according to instructions from the Division Headquarters of the American Red Cross.

D. All monthly reports must reach their destination by the tenth of the following month.

## III. RECORD FORMS.

A. Records for prenatal and infant hygiene nursing can be secured with family folder (social history) by ordering No. 5F (specifying as enclosures prenatal and child welfare cards) from Mead, Wheeler & Co., 3558 Wabash Avenue, Chicago, Illinois.

B. Records for school nursing comprise the United States Public Health Service card entitled "Physical Examination of School Children" and "Parents' Notification Card."

## IV. DUTIES OF COUNTY PUBLIC HEALTH NURSE

A. **Communicable Diseases.** (See state or local regulations for the Control of Communicable Diseases.)

1. Follow-up of cases reported to the health officer.
   (a) To give bedside nursing demonstration (only after consulting attending private physician)

(b) To instruct a responsible member of the family or attendant or patient in:

(*1*) Isolation of patient

(*2*) Care of articles contaminated with discharges from patient

(*a*) Dishes, etc.

(*b*) Linen and clothing

(*c*) Bedpans and urinals

(*d*) Toys

(*3*) Care of attendant's hands

(*4*) Proper disinfection and disposal of patient's discharges and excreta

(*5*) Protection from flies

(*6*) Quarantine (or immunization) of contacts

(*7*) Terminal disinfection (care of walls, floors, bedding and bed)

2. If cases with suspicious symptoms are located by the nurse, she shall report the same to the health officer for his investigation.

B. **Infant Hygiene.**

Instructing mothers at home or in a class.

No nursing care nor feeding instructions to be given without first consulting the attending physician.

I 1. Demonstration of baby's bath

2. Clothing (exhibit model layette and patterns for same)

3. Feeding

(a) Breast milk

(b) Care of breasts

(c) Necessity of modification of cow's milk for artificial feeding

(d) Care of milk, nipples and bottles

(e) Importance of enough safe drinking water
(f) How to make barley water
4. Excreta
(a) Normal and abnormal urine
(b) Normal and abnormal stools
(c) Care of diapers (covered pail)
5. Importance of sufficient sleep
6. Importance of sufficient fresh air
7. Importance of protection from flies

C. **Prenatal Instruction.**
1. If the patient has a physician, consult him before advising patient. If the patient has no physician urge her to consult one so that she may secure a complete physical examination and make arrangements as soon as possible for physician's attendance at delivery.
2. If the patient insists upon employing a midwife, urge her to secure one who has been properly instructed. Give patient detailed instructions as to prenatal care, and secure, if possible, a specimen of her urine for examination by health officer. If possible have health officer make a physicial examination.
3. Points to be stressed in prenatal instruction
(a) Necessity of medical examination early in pregnancy
(b) Clothing
(c) Diet
(d) Exercise
(e) Care of bowels
(f) Care of teeth
(g) Care of breasts
(h) Prompt reporting to doctor or nurse of danger signals

(i) Preparation and sterilization of articles for mother's delivery and preparation of baby's layette

(j) Preparation of room for delivery (separate bed, clean linen, newspaper pads, sufficient sterile water—hot and cold)

(k) Preparation of mother immediately before delivery (clean clothes, hair braided in two braids, enema)

D. **Instruction of Midwives.**

Whenever possible, midwives should be instructed in a class of not over 15 in accordance with an approved course of lectures and demonstrations.

E. **School Nursing**

In the absence of a special school nurse and with the approval of the local school boards, the county nurse should undertake this branch of the work.

1. Routine individual examination of school children in rural and town schools shall be made once a year.
2. Where the nurse has only town schools, a thorough classroom examination should also be made after each vacation (September, January, spring vacation).
3. The nurse should consult with the county health officer and the superintendent of schools in formulating all plans for medical inspection of school children. After her routine inspection of the school children, she should refer cases which need a special examination to the acting school physician or health officer, and a notification card, recommending the correction of the defects

by the child's family physician or dentist, should be sent to the parents.

4. Routine notification by card or visit should be made to the parents of all children having defects: (*a*) if diagnosis is made by physician or dentist, notice should state nature of condition; (*b*) if no physician sees case, the nurse should notify parents of *apparent* condition needing diagnosis by physician or dentist (*never make a statement that might be construed as a diagnosis*); (*c*) in cases requiring immediate attention, or when parents are likely to be antagonized by notification card, a visit should be made to the home as soon as possible.

5. First visit to school

   Always precede first inspection by a general health talk, suiting the content to the age of children addressed. By this method the nurse can inform both the teacher and the pupils of what her plans are regarding examination of pupils and what she hopes to accomplish.

6. Routine classroom inspections

   The nurse takes position by the window and requests pupils to stand, one row at a time, roll sleeves above elbows and file past, one at a time, while she notes general appearance, condition of skin, hair, eyes and oral cavity.

   (a) Try to avoid touching children. By training them to pull down lower eyelid, signs of inflammation may be detected and, by having them lift up hair back of ears, pediculi may usually be seen.

(b) Place a supply of tongue blades on clean sheet of paper and drop blade used, after each mouth and throat examination, into a paper bag or funnel. See that these are burned before leaving school. Check up each case of adenoids, defective vision, tonsils and teeth, as soon as possible after routine inspection.

7. Points to be observed in making individual examination and in reporting defects:

(a) EYES

(*1*) Vision—Report vision as "defective" where pupil is unable to read correctly the 30-foot line at 20 feet, testing each eye separately. DO NOT REPORT vision defective if child can read 30-foot line at 20 feet and has no symptom of eye strain. Use Snellen's literate eye chart for children knowing letters. Snellen's eye chart for children not knowing the alphabet can be secured from several manufacturers.

(*2*) Other symptoms—crossed eyes, discharge, granulated eyelids or styes, ingrown lashes.

(b) EARS

To be done only in a quiet place away from the class room. Report defective hearing when pupil is unable to hear whispered conversation at a distance of from 15 to 20 feet. Record "unable to hear whisper at 20 feet." Report all discharging ears.

(c) NOSE

Report obvious cases of nasal obstruction in one or both nostrils such as might occur with deviated septum, polypi, etc. Have the pupil press finger on alternate nostrils and breathe with mouth closed. REPORT mouth breathers with characteristic adenoid facies.

(d) THROAT

Report all cases of enlarged tonsils with histories of recurrent tonsilitis or where the size of the tonsils causes difficulty in swallowing or thickened speech. Do not report other enlarged tonsils unless obviously diseased.

(e) TEETH

Report all teeth which are decayed. Report reddened and inflamed gums, crooked teeth, marked protrusion of upper teeth, offensive breath, and defects of mouth formation.

(f) GLANDS

Report glandular enlargement, especially when accompanied by evidence of malnutrition and anemia.

(g) MENTAL RETARDATION

Report cases of apparent defective mental development for further investigation. DO NOT REPORT as mentally defective one who is backward on account of recent illness, poor physical condition, ignorance of English, or continued absence from school.

(h) WEIGHT AND MEASUREMENT

In town schools, children should be weighed monthly. In rural schools, children should be weighed once a year. Have children remove shoes and coat before weighing or measuring.

WEIGHT. If possible, secure a non-spring scale.

HEIGHT. Record in inches.

(i) PEDICULOSIS

Exclude for one day. Talk to children *privately* about necessity of having clean head. Give note and written instructions to be taken to parent. If, on the following visit, nothing has been done, make home call and give demonstration. *Always secure parent's consent before applying treatment for pediculosis.* Use much tact in approaching this subject.

(j) VACCINATION

Report to school superintendent all children who do not present a doctor's certificate of successful vaccination, if there is no evidence of successful vaccination. Make similar report to the health officer. (This depends upon local or state vaccination laws.)

8. Records

(a) A medical inspection card should be made for each child and these should be filed in the nurse's office. If the rural school cards are used for other members of the family, the school cards should be filed in the regular family folder referred to under III, Record Forms. Through the superintendent's office secure—

(*1*) Names of children who have moved within the county. Record change of home and school address on medical record.

(*2*) Names of children whose scholarship records are to be transferred with the child to a school outside the county. Give superintendent a copy of medical record to accompany other records.

(b) All defects should be noted concisely

(c) Urgent defects should be underlined

(d) After a defect has been corrected, record the date of correction in space provided

(e) If the family physician, after examining the child, reports the recommended correction of the defect unnecessary, note the case as closed and record a complete examination of the same, together with reason for closing.

(f) Record date of home visit in space provided

9. Health Instruction

(a) Health Talks

The nurse shall confer with the superintendent or school principal in regard to health talks. She could keep in touch with the teacher's schedule on Health Instruction, and follow up with talks emphasizing important points, varying health talks with grade visits. The following subjects should be covered:

(*1*) Fresh air—need for it at night as well as day

(*2*) Proper amount of rest
(*3*) What, and what not, to eat, stressing the value of milk and water, the danger of too much tea and coffee
(*4*) Mastication of food
(*5*) Correct posture and necessity for deep breathing
(*6*) Care of the body—special care of hair, nails and teeth
(*7*) Prevention of colds (infectious)
(*8*) Proper use of handkerchief (sneezing and coughing)
(*9*) Washing hands, especially before meals
(*10*) Danger of putting articles in mouth and biting fingernails
(*11*) Proper clothing—clothing to be suited to changes in temperature, need for frequent changes of clothing, stressing need for buttons, hooks, eyes, and shoe laces in their proper places.
(*12*) Meaning of quarantine and isolation (upper grades)
(*13*) Proper protection of feet—stress use of rubbers and changing wet shoes and stockings

(b) Health Drills (Children should go through actual procedure with necessary accessories, and not depend upon pantomime)

(*1*) Toothbrush Drill

(*a*) Keep record of number of pupils in class having toothbrushes at time of first drill and number who have brushes at time of last drill.

(*b*) Generally confine to first, second and third grades

(*c*) Instruct children to keep toothbrushes wrapped in clean white paper or envelope when bringing them to school for drill

NOTE.—Some manufacturers will send sample tubes of paste upon request. Toothbrushes may be purchased by the gross at about 5 cents each.

(*2*) Handkerchief Drill (confine to kindergarden and first and second grades)

(*3*) Handwashing Drill

Emphasize washing before meals

10. Contact with Teachers

Before visiting a school, it is well to notify the teacher of the approximate date of the nurse's visit. Before leaving school, be sure the teacher has a copy of the chart giving symptoms of communicable diseases, obtainable from the state health agency. Also confer with him regarding the obvious symptoms of physical defects, such as—

(a) Pupils not seeing well
(b) Pupils not hearing well
(c) Pupils complaining of headaches, particularly at the latter part of the day
(d) Pupils complaining of toothache
(e) Pupils breathing with open mouths
(f) Pupils asking to leave the room too frequently
(g) Pupils having habitual colds

11. Contact with Parents

If practicable, the teacher may ask parents to be present when the nurse visits the school.

The nurse should inform parents of a regular hour for consultation at her office. If there is a Parent-Teachers' Association, use every opportunity of explaining the aims of the work to them.

12. Follow-up Calls
    (a) To learn why defect has not been corrected
    (b) To urge and persuade the correction if it has been neglected through carelessness, prejudice or ignorance
    (c) To learn the financial condition of the parent, if he claims that he is unable to pay for a physician to examine and correct his child's defect
    (d) To demonstrate—
        (*1*) Treatment for Pediculosis. Mix thoroughly equal parts of kerosene oil and vinegar. Saturate hair and cover the head with a towel, for at least ½ hour. Then remove towel and comb hair thoroughly with fine tooth comb. Finally, wash with plenty of hot water and toilet soap. Rinse well and dry the head thoroughly.
        (*2*) Ventilation of sleeping rooms
        (*3*) Bath, if no facilities are available at school
13. Arrangements for correction of defects for children of parents who are unable to pay
    (a) If, after a thorough investigation of the parent's financial condition, the nurse believes that he is unable to pay, she should arrange to send the child to the physician for the poor, for treatment of minor ailments.

(b) Arrangements for special treatment, such as operations, refractions, etc. The nurse in cooperation with the county health officer and local physicians and dentists, should try to stimulate the formation of a clinic for the treatment of actual indigents (see instructions for nurse as to social technique for free clinic).

14. Sanitary inspection of school buildings

The nurse should make a sanitary inspection of all town school buildings at least once a month, and of all rural school buildings at least once a year. She should note in this inspection whether the buildings comply with the laws or regulations and report points of non-compliance to the health officer, or to the superintendent of schools having jurisdiction. In the latter case, reports should be made in a tactful manner, giving full explanation of why the irregularities need to be remedied.

## V. NURSING EQUIPMENT

1. Visiting Nurse Bag
2. Butchers' aprons for bedside nursing demonstrations. Plain black or navy blue tailored hats are desirable, and if wash uniforms are worn, they should be tailor-made of plain blue, gray or white material.

## VI. NURSING TECHNIQUE

### A. Care of Hands.

1. Scrub thoroughly with nail brush, soap and warm water before and after caring for the patient. After caring for a communicable

disease, clean nails with toothpicks, using fresh ones for each case.

2. Surgeon's gloves to be worn
   (a) In giving bedside care to scarlet fever or erysipelas
   (b) Sterile gloves in demonstrating a post-partum perineal dressing.

B. **Care of Apron after Communicable Disease Nursing.**

After scrubbing hands, fold apron right side in and place in paper bag. If left in patient's room, direct family not to open. Return apron to office in bag and, after soaking in disinfectant, send to laundry.

C. **Disinfection of Thermometers.**

1. Before taking temperature, rinse thermometer in running water
2. After taking temperature, scrub under running water with soap, wrap in piece of cotton saturated with 70% alcohol, leave 20 minutes. Whenever possible, induce cases of communicable disease to purchase a thermometer for personal use.

D. **General Routine in House.**

1. Remove hat and coat, placing on chair away from the wall or bed. Place bag on a clean newspaper on a chair or table. If visiting a case of communicable disease, leave hat, coat and bag in outer room.
2. Take everything needed for the visit from the bag before beginning work.
3. Place articles taken from the bag either in an apron pocket or upon a piece of clean paper (preferably a paper towel).

4. If these articles have been handled after hands have been soiled with infective discharges from patient, scrub hands and disinfect articles before replacing them in bag.
5. Visit maternity cases before communicable diseases, if possible.

## VII. STIMULATION AND CONDUCT OF CLINICS

A. **For Correction and Treatment of Defects.**

1. Indigent school children
2. Indigent infants and pre-school children
3. Communicable diseases, particularly of the skin and eyes, and for venereal infections.

B. **Technique in Clinic Organization and Management.**

1. After consultation with the health officer, the nurse should try to induce local physicians and dentists to cooperate in giving clinic service for the treatment of the above classes unable to pay the fee charged for a private case.
2. Arrange for the social financial investigation of each patient applying to the clinic. All patients who, after such an investigation, are found able to pay for a private physician's care should be excluded from the clinic.
3. Before admitting an applicant to the clinic, learn by what local physician he, or members of his family, have been previously treated. Unless the case demands emergency care, delay admission of the applicant until he returns with a letter referring him to the clinic and signed by his family physician.
4. **Form Letter to be sent to the Family Physician of Applicant:**

Name of Clinic

Date....................

To Dr......................

Mr.............................has applied here for treatment for .............................. We are delaying the admission of this patient until we receive your signed approval on the form below.

..........................

Director of Clinic

Date...............

To Clinic:

I hereby refer Mr. ................to......................Clinic for treatment for......................... In my estimation he is unable to pay for adequate medical attention.

(Signed)......................M.D.

C. **Organization of Prophylactic Infant and Child Hygiene Clinics.**

Clinics held for the weighing and measuring of infants and children and for advice concerning their proper feeding and care shall be open to all of the public, regardless of financial circumstances. In cases of illness, the clinic physician or nurse should refer the parents to their private physician, or, if they are unable to pay, to the clinic for free treatment.

## VIII. PUBLICITY

A. **Newspapers.**

In consultation with the local health officer, the nurse should keep local newspapers supplied with interesting occurrences in her work, avoiding always the giving of information that might identify an individual case or family.

B. **Talks to Clubs, Churches, Parent-Teachers' Association.**

Whenever possible, the nurse should explain her program to the above organizations.

C. **Exhibits—Infant and Child Health Conferences.**

Material and advice for these can be secured from the state agency of health or child welfare.

APPENDIX IV

# A PLAN OF ORGANIZATION FOR MEDICAL, NURSING AND RELIEF SERVICE FOR LOCAL COMMUNITIES, DURING EPIDEMICS

## COMMITTEES

1. Central Committee.
2. Finance Committee.
3. Intelligence Committee.
4. Medical Service Committee.
5. Nursing Service Committee.
6. Hospitalization Committee.
7. Subsistence and Relief Committee.
8. Transportation Committee.
9. Mortuary Committee.

## 1. CENTRAL COMMITTEE.

PURPOSE—To direct, coordinate and supervise the work of the various committees.

DUTIES—(a) Organize a central committee consisting of the health officer, the principal Red Cross official, the mayor or chairman of the county commissioners and two others.

(b) Appoint the chairmen of the other committees herein suggested, and to outline and supervise their work.

(c) Meet daily for conference with chairmen of other committees, at 5 P.M. or other suitable hour.

## 2. FINANCE COMMITTEE.

PURPOSE—To provide the funds required for the entire organization, and disburse the same.

DUTIES—(a) Provide method of financing through city or county authorities, the local or national Red Cross, or private subscription.

(b) Disburse funds available on demand of chairmen of committees, after approval by central committee.

3. **INTELLIGENCE COMMITTEE.**

PURPOSE—To locate promptly cases of illness, and cases requiring subsistence, relief, medical or nursing service.

DUTIES—(a) Provide a central clearing house in headquarters. Here all reports from field workers are to be received and referred to the proper committees.

(b) District city or rural area into districts, with a captain and ten lieutenants in each. Districts should be of such size (e.g. ten city blocks) that each lieutenant can cover his unit within one hour each morning.

(c) Select a captain living in each district, who shall appoint and be responsible for his lieutenants living in each unit of the district.

(d) Lieutenants are to canvass every house in unit the first thing each morning, rendering a report to the captain, by ten a.m., who in turn reports to chairman of committee at central clearing house by eleven a.m.

(e) Chairman of committee segregates reports, and sends each report to the chairman of the proper committee of the organization.

(f) A staff of special intelligence lieutenants is to be maintained at the central clearing house, to investigate at once special reports not received from district captains.

4. **MEDICAL SERVICE COMMITTEE.**

PURPOSES—To provide medical attention for all cases reported by intelligence committee, which cannot be hospitalized, and to provide the medical staff for emergency hospitals.

DUTIES—(a) List all available physicians who will volunteer for public service, either whole or part time.

(b) Assign volunteers, and physicians provided by the United States Public Health Service and the State Department of Health, to the emergency and other hospitals, and to cases in rotation, keeping a waiting list of patients.

5. **NURSING SERVICE COMMITTEE.**

PURPOSES—To secure all available trained and practical nurses in the community to head wards in hospitals and give instructions to volunteer nurses' aids. To obtain nurses' aids.

DUTIES—(a) List all trained and practical nurses in the community.

(b) Organize a corps of nurses' aids, preferably women who have had First Aid or additional Red Cross courses.

(c) Assign all nurses and nurses' aids to hospitals and cases as required. All nurses and nurses' aids are to report at once to chairman of committee on completion of case, for re-assignment.

(d) Receive and act upon reports from chairman of intelligence committee, physicians, etc., as to need for nurses.

6. **HOSPITALIZATION COMMITTEE.**

PURPOSE—To provide hospital facilities and if necessary to secure location and equipment for, and install and manage, emergency hospitals.

DUTIES—(a) List all available accommodations in existing hospitals.

(b) Keep hospital accommodation list up to date by checking out all deaths and recoveries.

(c) As required, provide additional emergency hospital accommodations.

(d) Assign cases as required to hospitals, according to accommodations available.

(e) Receive and act upon reports from chairman of intelligence committee, physicians, etc., as to cases requiring hospitalization.

(f) Notify chairman of transportation committee to provide transportation of cases to and from hospitals.

**7. SUBSISTENCE AND RELIEF COMMITTEE.**

PURPOSE—To provide prepared food, or food supplies, fuel or other supplies to families and persons sick, as needed.

DUTIES—(a) Receive reports from chairman of intelligence committee, physicians, etc., of cases requiring subsistence or relief.

(b) Make special investigation of requests for subsistence or relief not received through organization channels, by means of special investigators; at least one such special investigator to be always on duty during the day.

(c) Establish diet kitchen and commissary for disbursement of prepared food and supplies.

(d) Organize personnel for preparation, issue and distribution of food and supplies.

(e) Requisition transportation for food and supplies from chairman of transportation committee.

**8. TRANSPORTATION COMMITTEE.**

PURPOSE—To provide system of transportation for physicians, nurses, relief, supplies, subsistence, intelligence, hospitalization, etc.

DUTIES—(a) List all available automobiles, trucks, boys with bicycles, etc.

(b) Receive requests for transportation from chairmen of other committees.

(c) Assign available transportation service as required.

9. **MORTUARY COMMITTEE.**

PURPOSE—To see that adequate burial facilities are available to meet the emergency.

DUTIES—(a) List all available burial and crematory facilities, and undertakers.

(b) Provide and supervise edequate force of grave-diggers, undertakers' assistants, etc.

(c) Assign deaths to undertakers and burial grounds or crematories according to capacity.

# APPENDIX V

## LECTURE COURSE FOR MIDWIVES

The following course of instruction is intended to be given by a trained nurse. It has been offered to women living in isolated rural communities, where medical attendance was lacking, irrespective of whether the students were midwives or not.

### LECTURE I

#### Care of Baby

1. Care of baby at birth
   (*a*) Grease child (*clean lard or oil*), especially head
   (*b*) Application of binder to secure cord dressing
   (*c*) First clothes—review of layette
   (*d*) Asphyxia—hold up by feet and spank until baby cries and breathes
2. Demonstration of baby's bath
   (*a*) Sponge until after cord is off. First bath three hours after birth (grease child before bathing)
   (*b*) Tub bath (hands supporting back of neck and head) after cord comes off.

### LECTURE II

#### Care of Baby (Continued)

1. Nourishment
   (*a*) Regularity of feeding
   (*b*) Method of giving water (lack of water shown by brick red stains on diaper)

2. Sleep
   (*a*) Individual bed
   (*b*) Open windows (avoid draughts)
   (*c*) Regularity—18 to 22 hours
3. Danger signals for baby
   (*a*) Eyes—inflammation and discharge (report to physician)
   (*b*) Bleeding cord—(report to physician)
   (*c*) Convulsions—(report to physician)
   (*d*) Failure to nurse (report to physician)
   (*e*) Unusual jaundice (report to physician)
   (*f*) Failure to pass urine or feces after 24 hours (report to physician)

## LECTURE III

### Health in Home

1. Personal hygiene
   Baths, clean clothes (especially when attending woman in or after confinement), separate drinking cups, towels, kissing, sneezing, coughing, spitting
2. Cleanliness in kitchen
   (*a*) Boiling dishes
   (*b*) Proper disposal of garbage to avoid flies
   (*c*) Flies—fly trap
3. Location of sick room
   Bed-making and care

## LECTURE IV

### Prenatal Care

1. Pregnancy—simple explanation (illustrate with flowers)
2. Instructions as to what prenatal mother should know
   (*a*) Diet
      (1) Plenty of water
      (2) Avoid overeating

(3) Avoid much meat
(4) Drink plenty of milk—stress keeping cow for milking—care, feeding, etc. (for rural women)
(5) Eat as much fruit and fresh vegetables as possible

(*b*) Hygiene
(1) Proper clothing (suspended from the shoulders)
(2) Proper exercise (avoid lifting heavy things and using sewing machine with foot power)
(3) Daily bowel movement (simple remedies for constipation—fresh or cooked fruit, senna, prunes, coarse cereals)
(4) Bathing (avoid very hot or cold baths)
(5) Fresh air
(6) Rest—sleep alone, and rest twice daily for fifteen minutes

(*c*) Care of breasts
(1) Avoid pressure on breasts
(2) Bathe daily with soap and water
(3) Care of depressed nipples (massage)

(*d*) Varicose veins (demonstration of bandaging)

(*e*) Instructions mother should have about preparing for confinement
(1) House supplies—patient's bed—demonstrate making (linen and oil cloth)
(2) Baby's bed—box, drawer, or basket
(3) Baby's layette

3. Need for medical attention
(*a*) Headache, spots before the eyes, puffiness under the eyes, swelling of ankles, vaginal bleeding, much vomiting after third month (stress reporting these to physician at once)
(*b*) Need of testing the patient's urine by a physician

## LECTURE V

### Bedside Care

1. Immediate preparations before confinement
   (*a*) Clean clothes
   (*b*) Supplies out, but not open
   (*c*) Hot and cold water
   (*d*) Enema
   (*e*) Keep away from toilet after water breaks
2. Bed bath—24 hours after confinement. Changing bed with patient in it.

## LECTURE VI

### Bedside Care (Continued)

1. Perineal dressing
2. Combing hair
3. Diet after confinement
   (*a*) Liquids for first two days
   (*b*) Soft light diet on third day
   (*c*) Avoid much tea, coffee, meat and fried foods
   (*d*) Stress water, fruit and vegetables
4. Care of bowels
   (*a*) Cathartic on forenoon of third day (ounce of castor oil followed by saline enema in six hours)
   (*b*) Daily bowel movement thereafter
5. Applications of heat and cold
   (*a*) Flaxseed poultice
   (*b*) Mustard paste
   (*c*) Cold compress
   (*d*) Hot water bottle and substitutes

## LECTURE VII

Review of all previous lessons and examination

## LECTURE VIII

(Special for Midwives)

1. Bag equipment
   (*a*) Care to have listed articles and care of each
      (1) Clean apron
      (2) Cake of white soap (Ivory or Fairy)
      (3) Nail brush
      (4) Lysol
      (5) 2 clean towels wrapped in clean cloth
      (6) Clean lard or salad oil
      (7) Cord dressing and tape (might be furnished by county health department)
      (8) Pair scissors (blunt points)
      (9) Nitrate of silver 1 per cent. (might be furnished by country health department)
      (10) Absorbent cotton (in clean box or clean cloth)
      (11) Enema bag (if possible)
   (*b*) Care to have nothing superfluous (no other articles than described in the list)
   (*c*) Care of articles (all linen to be boiled between cases)
   (*d*) Reasons for carrying bag
   (*e*) Demonstrate scrubbing hands, making up lysol solution
2. Immediate after-care of baby
   (*a*) Eyes
      (1) At birth, silver nitrate 1 per cent.—two drops in each eye
      (2) Daily care, boracic acid solution, demonstrate separate swab for each eye (swabs burned after using)
   (*b*) Cord
      (1) At birth. Tie with sterile tape; avoid thread or string (why); cut with boiled scissors;

apply sterile cord dressing (tape and cord dressing might be furnished by county health department), or substitute clean rag with hole burned in it

(2) Proper procedure in changing dressing if it is soiled (umbilical infections).

## LECTURE IX

### Course of Labor

(To be given, if possible, by a physician)

1. First stage—up to sixteen hours (wide variation)
   (*a*) Pains in back, then front, recurring more frequently (this is usual, but not invariable)
   (*b*) Let patient walk, sit or lie down
   (*c*) Give enema
   (*d*) Urge liquids if labor is long
2. Second stage—few minutes to two hours
   (*a*) Pains harder, more frequent, and, as a rule, bearing down
   (*b*) Rupture of bag of waters (normal, but not invariable)
   (*c*) Bulging of perineum
   (*d*) Protection of perineum (place hands on head of child with gentle force, allowing head to advance a little with each pain)
   (*e*) Escape of head
   (*f*) Delivery of shoulders and body
   (*g*) Cutting cord—technique
   (*h*) Asphyxia—treatment
3. Third stage
   (*a*) Interval between birth of child and expulsion of placenta, one-half hour

(*b*) Never pull on cord to deliver placenta
  (1) Pulling interferes with normal contraction of placenta into a longitudinal roll. Causes it to spread out and block the mouth of the uterus
  (2) Danger of leaving pieces of the placenta in the uterus
  (3) Sometimes causes eversion of uterus

(*c*) Gently knead abdomen, until the uterus hardens, and exert downward pressure

(*d*) If placenta is not delivered in one hour after birth, call a physician (meanwhile keep up pressure on fundus)

4. Abnormal presentation—breech cases
  (*a*) Seize the feet of the child and lift them straight up over the mother's abdomen until the mouth is exposed or reverse this process, depending on position of child
  (*b*) Traction by shoulders, or with fingers in child's mouth

5. Complications of labor—when to call a physician
  (*a*) Antepartum hemorrhage (placenta praevia)
  (*b*) Very frequent and hard pains with no progress apparent after 24 hours
  (*c*) Internal hemorrhage (patient weak, pale, chilly, or very thirsty, panting for breath)
  (*d*) Child's hand down—transverse presentation
  (*e*) Water not breaking—pains frequent and patient frantic
  (*f*) Too hard or long labor—24 hours
  (*g*) Severe headache, blindness, convulsions (eclampsia)
  (*h*) Delay in twin births

(*i*) Sudden cessation of pains, withdrawal of fetal head with or without bleeding—generally prostration (rupture of uterus)

(*j*) Prolapsed cord (child may die)

6. Review of safety rules

### LECTURE X

Review and examination, if possible, with last lesson.

# APPENDIX VI

## A DAIRY SCORE CARD

The following score card for dairies has been developed from that issued by the Bureau of Animal Industry, U. S. Department of Agriculture. It differs from the latter in that it lays more emphasis on methods than on equipment. While good equipment renders the production of clean milk much easier, nevertheless it is entirely possible to secure quite satisfactory milk with very meager equipment, provided the dairyman applies sanitary principles to such as he has.

### DETAILED DIRECTIONS FOR USING THE DAIRY SCORE CARD

I. GENERAL INSTRUCTIONS

1. STUDY these detailed instructions carefully, and have them well in mind before scoring a dairy. It is best to review them before commencing a series of scores, and to refer to them whenever in doubt.
2. On scoring trips, always carry a folding three-foot rule, a reliable thermometer, a supply of score cards, and a copy of these directions.
3. *Before commencing to score,* the inspector should look over the entire plant, and be familiar with the layout, the number of employees and their duties, the number of cows, the times and sequences of operations, etc. Make a written record of all such information, and keep it on file in the office.

FACE OF DAIRY SCORE CARD
(Size $6\frac{3}{4}'' \times 9\frac{1}{4}''$)

# NEW MEXICO STATE BUREAU OF PUBLIC HEALTH

## DAIRY FARM SCORE CARD

(Modified from Standard Card of U. S. Bureau of Animal Industry)

| Equipment | Score: Perfect | Score: Allowed |
|---|---|---|
| **COWS** | | |
| Health | 6 | ........ |
| Apparently in good health........... 1 | | |
| If tested with tuberculin within a year and no tuberculosis is found, or if tested within six months and all reacting animals removed......... 5 | | |
| If tested within a year and reacting animals are found and removed............. 3 | | |
| **STABLES** | | |
| Location of stable | 1 | ........ |
| Well drained........ ½ | | |
| Free from contaminating surroundings............. ½ | | |
| Construction of stable | 3 | ........ |
| Tight, sound floor and proper gutter 2 | | |
| Proper stall, tie, and manger.......... 1 | | |
| Provisions for light: Four square feet of opening per cow | 3 | ........ |
| (Three square feet of opening, 2; two square feet, 1; one square foot of opening, ½; deduct for uneven distribution.) | | |
| Ventilation | 4 | ........ |
| Ventilators in roof... 1 | | |
| Windows hinged at bottom........... 1 | | |

| Methods | Score: Perfect | Score: Allowed |
|---|---|---|
| **COWS** | | |
| Clean (curried and brushed) | 6 | ........ |
| (Free from visible dirt, 4) | | |
| **STABLES** | | |
| Cleanliness of stables | 5 | ........ |
| Floor............... 2 | | |
| Walls.............. ½ | | |
| Ceiling and ledges... 1 | | |
| Mangers and partitions............. 1 | | |
| Windows........... ½ | | |
| Stable air at milking time | 3 | ........ |
| Freedom from dust.. 2 | | |
| Freedom from odors. 1 | | |
| Barnyard | 2 | ........ |
| Clean.............. 1 | | |
| Well drained........ 1 | | |
| Removal of manure daily to 50 feet from stable | 1 | ........ |
| **MILK ROOM OR MILK HOUSE** | | |
| Cleanliness of milk room | 3 | ........ |
| **UTENSILS AND MILKING** | | |
| Care and cleanliness of utensils | 8 | ........ |
| Thoroughly washed.. 2 | | |
| Sterilized in steam for 15 minutes.......... 3 | | |
| Placed over steam jet, 2; scalded with boiling water, 1. | | |
| Protected from contamination........ 3 | | |
| Cleanliness of milking | 11 | ........ |
| Clean, dry hands.... 4 | | |
| Udders washed and wiped............ 7 | | |
| (Udders cleaned with moist cloth, 4; cleaned with dry cloth or brush at least 15 minutes before milking, 1.) | | |

| Equipment | Score | | Methods | Score | |
|---|---|---|---|---|---|
| | Perfect | Allowed | | Perfect | Allowed |
| (Sliding windows, 0.5). | | | HANDLING THE MILK | | |
| Cubic feet of space per cow, 500 feet.. 2 | | | Cleanliness of attendants in milk room............ | 2 | ........ |
| (Less than 500 feet, 1; less than 400 feet, ½; less than 300 feet, 0.) | | | Milk removed immediately from stable without pouring from pail... | 1 | ........ |
| | | | Cooled immediately after milking each cow...... | 3 | ........ |
| UTENSILS | | | Cooled below 50° F........ | 6 | ........ |
| | | | (51° to 55°, 4; 56° to 60°, 2.) | | |
| Construction and condition of utensils................ | 1 | ........ | Stored below 50° F....... | 3 | ........ |
| Water for cleaning.......... | 1 | ........ | (51° to 55°, 2; 56° to 60°, 1.) | | |
| (Clean, convenient and abundant.) | | | Transportation below 50° F. | 2 | ........ |
| Small-top milking pail..... | 5 | ........ | (51° to 55°, 1.5; 56° to 60°, 1.) | | |
| Milk cooler................. | 4 | ........ | | | |
| Clean milking suits......... | 1 | ........ | (If delivered twice a day, allow perfect score for storage and transportation.) | | |
| MILK ROOM OR MILK HOUSE | | | | | |
| | | | EMPLOYEES | 9 | ........ |
| Location; Free from contaminating surroundings.. | 1 | ........ | Medical examination twice a year including laboratory tests—new employees examined before working............ 9 | | |
| Construction of milk room... | 2 | ........ | Once a year, ditto..... 5 | | |
| Floor, walls, and ceiling........... 1 | | | Twice a year, except lab. tests......... 5 | | |
| Light, ventilation, screens........... 1 | | | Once a year, except lab. tests ............. 3 | | |
| Separate rooms for washing utensils and handling milk................... | 1 | ........ | If new employees not examined including lab. tests, deduct two-thirds of above. | | |
| Facilities for steam......... | 2 | ........ | | | |
| Steam sterilizing chest. 2 | | | | | |
| Steam jet.......... 1 | | | | | |
| Boiling water....... 0.5 | | | | | |
| Total............... | 35 | ........ | Total............... | 65 | ........ |
| | | | Equipment + Methods = Final Score | | |

### Reverse of Dairy Score Card

Owner or Manager.................................... R. F. D. No..............................

Post Office.......................................... County..................................

Trade name.......................................... Permit No...............................

License No..............................

Number of wagons......................... Gallons sold daily { Milk.............................. Cream..............................

Number of cows.........................

Date of inspection.........................192....

Remarks: ..............................................................................................

Bacteria counts........................................................................................

Butter fat...............................................................................................

Sediment tests..........................................................................................

..........................................................................................................

..........................................................................................................

Approved: ..........................................

Inspector.

.......................................... Health Officer.

........................County Health Department.

4. IN DOUBTFUL CASES, the doubt shall be resolved *against the dairyman.* No credit shall be given unless fully and clearly earned. Never give the dairyman the benefit of the doubt, as this removes both stimulus to improvement and incentive to improve his score.
5. *DO NOT GUESS.*—Have definite, personal information on each and every point. Personally inspect and check the tuberculin tests, identifying each cow with its test record. Personally identify each employee with his medical certificate. Examine every detail of operations, each piece of equipment, in person: *do not* take any person's word for anything, if it is possible for you to verify it yourself. Measure carefully barns, windows, etc., and record the measurements on the back of the card, at all first scorings, and whenever changes are made. Personally take the milk temperatures and record them on the back of the card.
6. When you have completed the scoring, look the card over again carefully, re-check any point as to which there is the slightest doubt. Do not give the dairyman a copy of the score at the time of inspection. After you have returned to the office, send him a copy with a letter giving detailed instructions as to how he can improve his score.
7. NEVER GET INTO AN *ARGUMENT* with a dairyman about his score. Be courteous, answer his questions, give him whatever explanations or information he may need, be firm, but *do not argue.*
8. Do not let the dairymen have advance information of dates and times of inspections. It is best to

score at the morning milking, returning for the evening milking if necessary to complete the score.

9. It is advisable to publish the relative scores from time to time in local newspapers. List the dairies in the order of their scores, putting the highest score first.

II. EQUIPMENT

10. COWS. **Health.**—Cut off 0.1 for each cow in a string of twenty or less, or for each two cows in a herd of 40, or for each three cows in a herd of 60, that have any defect of health. In case of open abscesses, retained after-birth, garget or inflamed udders, etc., cut off 0.5 or more and order cow removed from milking string.

11. COWS. **Tuberculin Test.**—If entire herd, including bulls, is not tested, give no credit under this item, unless omitted animals are dry stock on range and not to be returned to milking string unless first tested and passed. If new animals are purchased and added to the milking string without *first passing* the tuberculin test, allow *no credit* under this item.

12. STABLES. **Location of Stables.**—Well drained into a sub-surface irrigation system or covered cesspool, give 0.5. When sufficient and proper absorbent is placed in gutters to absorb all urine, give 0.3; well-kept open flumes, give 0.2. When corral is next to milking barn give 0.3; if adjacent area or corral is dusty, allow no credit. If *open* privy within 200 feet, deduct 5.0 from total score, and allow no credit under "Free from contaminating surroundings"; if

*open* privy within 100 feet, allow no credit as above, and deduct 10.0 from total score.

13. STABLES. **Construction of Stables.**—When floor is of cement concrete with gutter 14 inches wide by 6 inches deep, and 4 feet 4 inches from gutter to wall, give 2.0; when gutter is of less dimensions, deduct 0.2 or more; when distance from gutter to wall is less than 4′ 4″, deduct 0.2 or more. For sound tight wooden floor and concrete gutter, dimensions as above, allow 1.3; for cracks in floor deduct from this 0.5 or more. For iron stanchions and concrete manger give 1.0; for stanchions of dressed lumber, painted, with concrete manger, give 0.9; for stanchions and mangers of dressed lumber, painted, give 0.6; deduct 0.2 for lack of paint. For rough wood stanchions and mangers, allow not more than 0.3, according to condition.
14. STABLES. **Provision for Light.**—Give as directed on card. Make no allowance for doors, unless they have glazed sash, nor for cracks. *Actually measure* the area of light openings.
15. STABLES. **Ventilation.**—Give as directed on card. *Actually measure* dimensions of stables. Make no allowance for doors or cracks. For open-sided barns with at least three feet vertical of open space along both sides between top of side wall and eaves of roof, allow 1.0 for windows.
16. UTENSILS. **Construction and Condition of Utensils.**—When all seams are well soldered, with no rough or rusty places, give 1.0; when seams are rusty or broken in spots, give 0.7 or less; for battered utensils, deduct 0.1 or more.

17. UTENSILS. **Water for Cleaning.**—Water piped from clean sources to a sink, allow 1.0; water carried in buckets from clean source, allow 0.5; water in kitchen, allow 0.2; water from doubtful source, allow nothing.

18. UTENSILS. **Small Top Milking Pail.**—Gurler, Sterilac or equal small top strainer pails for all milkers, and all milkers using them at all milkings, allow 5.0; Fishmouth or equal pails, ditto, allow 4.0; ordinary hooded pails, ditto, allow 2.0. Deduct in proportion for any milkers using open ordinary pails.

19. UTENSILS. **Milk Cooler.**—Brine, or duplex water and brine, cooler, give 4.0. Perfection or equal tubular water cooler, give 2.5; conical water cooler, give 1.0; if iced to at least one-half inside water capacity, allow 1.5. Deduct for insufficient capacity of cooler, or if not used at every milking.

20. UTENSILS. **Clean Milking Suits.**—Clean white suits and caps for milking only, allow 1.0; clean colored ditto, allow 0.6. Deduct if not kept in clean closet between milkings, or if soiled. Allow no credit under this item if no special milking suits.

21. MILK ROOM OR MILK HOUSE. **Location.**—If corral is within 50 feet of milk house, deduct 0.5; if milk house is more than 30 feet from milking barn, deduct 0.3. If milk room opens direct into milking barn without intervening room or vestibule and doors, deduct 0.5. Deduct for dusty, dirty or insanitary surroundings.

22. MILK ROOM OR MILK HOUSE. **Construction of Milk Room. Floor, Walls and Ceiling.**—Floor, and walls to at least 4 feet in height, of smooth finish cement concrete, ceiling of smooth tongue and groove well painted with white or light colored paint, allow 1.0; plastered ceiling deduct 0.1; plastered walls deduct 0.1; ceiling not painted, deduct 0.1; walls not painted deduct 0.2. Walls and ceiling of rough wood, floor smooth concrete, allow 0.4; floor of wood, allow not more than 0.2. **Light, Ventilation and Screens.**—For glass windows on opposite walls, hinged at bottom, with hinged screens, double self-closing screen doors with intervening vestibule, and screened opening in roof, allow 1.0. Deduct 0.5 or more for lack of screens, or for screens in poor or ineffective condition. Deduct 0.3 or more for insufficient or poorly distributed light.

23. MILK ROOM OR MILK HOUSE. **Facilities for Steam.**—For steam piped from steam boiler of ample capacity, give 2.0; steam from ordinary boiling apparatus, 1.0; for actually boiling water allow 0.5; for hot, but not actually and continuously boiling water, allow not more than 0.3. For hot water in kitchen allow nothing.

III. METHODS.

24. COWS. **Clean.**—When cows are curried and well brushed at least one-half hour before milking, and udders are kept well clipped, give 6.0; ditto, once a day, allow 5.0; if udders are not kept well clipped, deduct 1.0 to 2.0, according to length of hair on udders. If free from

visible dirt, but not curried, brushed and clipped, allow up to 3.0; when soiled with mud or manure, or dusty, allow from 0.0 to 2.0 according to condition.

25. STABLES. **Cleanliness.**—When floor is washed with hose twice daily after milking, give 2.0; if swept clean with broom, ditto, give 1.5; if scraped well with shovel, ditto, give 1.0; once daily, give one-half of above. If *walls* are spattered with dirt or manure, allow 0.2 to 0.0. Deduct 0.5 to 1.0 according to amount of dust and dirt on *ceilings and ledges.* When *mangers and partitions* are hosed clean twice daily, give 1.0; if swept ditto, allow 0.6; once daily, give one-half of above. If floors and mangers not swept, hosed or scraped at least once daily, allow nothing under their respective items. *Windows* dusty or dirty, allow 0.2 to 0.0; if no windows, allow 0.5 under that item.

26. STABLES. **Stable Air at Milking Time.—Freedom from Dust.**—Where no hay or other dry feed is stored in milking barn, and no hay or dry feed is fed at milking time or for one hour previous, and no dustiness from corral or adjacent surroundings, give 2.0; deduct 1.0 for violation of above feeding rules; for dusty air from other causes deduct from 0.5 to 1.0. **Freedom from Odors.**—If no strong odor noticeable when entering milking barn, and no strong scented roots or feed are fed at milking time or for one hour previous, allow 1.0; deduct from 0.1 to 0.4 for violation of above feeding rules; deduct an additional 0.2 to 0.6 according to intensity of odors.

27. STABLES. **Barnyard. Clean.**—When scraped at least once a week, give 1.0. Deduct for dustiness, manure accumulations, etc., from 0.3 to 1.0. **Well Drained.** If dry, smooth and hard surfaced, give 1.0; deduct 0.3 to 1.0 for unevenness, mud, pools of water, etc.
28. MILK ROOM OR MILK HOUSE. **Cleanliness of Milk Room.**—When clean, airy and free from odors, give 3.0. When dried milk, sour milk, dust or dirt are found on walls, floor, utensils or equipment, deduct 1.0 to 2.0. When junk or unnecessary articles are stored in milk room, deduct 0.5 to 1.0. If presence of flies is noticeable, allow not more than 1.0 under this item; if flies are decidedly numerous, allow nothing.
29. UTENSILS AND MILKING. **Care and Cleanliness of Utensils. Thoroughly Washed.**—Well washed and scrubbed with soap or compound in hot water promptly after each milking, give 2.0; deduct 0.5 for unnecessary delay in washing (more than one hour after using). Deduct 0.2 for cold water; deduct 0.5 for lack of soap or compound; deduct 0.3 for lack of brushes.
30. UTENSILS AND MILKING. **Care and Cleanliness of Utensils. Sterilized in Steam for 15 Minutes.**—Steam under pressure of at least 10 lbs. per sq. inch for 15 minutes or more, give 3.0; for abundant streaming steam in steam chest with less than 5 lbs. but more than 1 lb. pressure, for 15 minutes, give 2.0; deduct one-half of above for 10 minutes' steaming; allow not more than 0.5 for less than 10 minutes steaming as above. **Placed over Steam Jet.** If

placed over strong steam jets for 10 minutes or more, give 2.0; less than 10 minutes and more than 5 minutes, 0.5; less than 5 minutes, allow nothing. Deduct for insufficient steam supply. **Scalded with Boiling Water.** Utensils and bottles completely immersed in *actually boiling* water for 10 minutes or more, allow 1.0; for 5 minutes or more, give 0.4; less than 5 minutes actual boiling, allow nothing. If hot or boiling water is poured into utensils, allow not more than 0.2. If immersed in water *not actually and continuously boiling*, allow not more than 0.3. If utensils or bottles are rinsed, after steaming or boiling, in cold water, allow no credit under this item, and deduct 20.0 from final score. If utensils or bottles are rinsed, after steaming or boiling, in approved strength of B. K. or equal solution for at least 10 minutes, and then thoroughly drained, allow up to 2.5 for steam jet or boiling, but allow nothing additional if steam under pressure is used. Note use of solution, and strength, on back of score card.

31. UTENSILS AND MILKING. **Protected from Contamination.**—If utensils and bottles are inverted in racks in well ventilated and screened room or compartment free from flies and dust, allow 3.0; if pins or projections extend into the interior of utensils or bottles while on racks, deduct 1.0; deduct 1.0 to 2.0 for presence of flies or dust; deduct 0.5 to 1.0 for outside exposure. If attendants in handling utensils or bottles after sterilizing, put hands or fingers inside of bottles or utensils, allow nothing under this item, and deduct 10 from final score.

32. UTENSILS AND MILKING. **Cleanliness of Milking. Clean, Dry Hands.**—When hands of milkers are thoroughly washed with soap and water, with paper or individual towels, immediately prior to beginning milking, and as often as hands are soiled during milking, give 4.0; if not, deduct 2.0 to 4.0, according to condition of hands. If any milker milks with *wet hands*, allow nothing under this item, and deduct 20 from final score. If there is no wash stand with running water, soap and paper or individual cloth towels in milking barn or milk room, deduct 1.0 to 2.0. **Udders Washed and Wiped.** Udders and flanks well washed with hose and sponge, and udders dried with a clean cloth within one-half hour before milking, give 7.0; not dried, deduct 1.0; dried with dirty cloths, deduct 2.0 to 4.0, according to condition of cloth. Udders washed with clean cloth and clean water in bucket, using fresh water for each cow, and dried with clean cloth, allow 6.0; deduct as above for not drying and for dirty cloths. If wiped with clean wet cloths, allow 4.0; deduct 1.0 to 3.0 according to condition of cloth and effectiveness of cleaning. For dry cloth or brush used at least 15 minutes before milking, allow 1.0; deduct 0.3 to 0.8 according to ineffectiveness of cleaning. From all of the above a general deduction may be made for any ineffectiveness of cleaning.

33. HANDLING THE MILK. **Cleanliness of Attendants in Milk Room.**—Deduct 0.2 to 1.0 for dirty clothing. If hands are not well washed with soap and water, and dried with clean paper

or individual cloth towels immediately before commencing work with the milk, deduct 0.2 to 1.0.

34. HANDLING THE MILK. **Milk Removed Immediately from Stable without Pouring from Pail.**—If milk is poured from pail in milking barn, allow nothing under this item. If milker waits to fill two pails before removing from barn, deduct 0.5.

35. HANDLING THE MILK. **Cooled Immediately After Milking Each Cow.**—Milk put over cooler as soon as cow is milked, give 3.0; as soon as pail is filled, give 2.0; within 15 minutes after milk is drawn from cow, allow 1.0; worse than this, allow nothing.

36. HANDLING THE MILK. **Cooling.**—The cooling must take place within one-half hour after milk is drawn from the cow, otherwise allow nothing under this item, but allow credit under storage.

37. HANDLING THE MILK. **Transportation.**—Statement in parenthesis following this item on card to be followed only insofar as it meets the following requirements: if delivery twice a day is on ice between May 1 and October 1, and under thoroughly wet sacks between October 1 and May 1, allow perfect score for storage and transportation. If worse delivery conditions, deduct according to temperature of milk at completion of afternoon delivery.

38. EMPLOYEES. **Medical Examinations** must be made by licensed physicians, who must render a signed written statement that they have made a complete and careful physical examination of the

employe or proposed employe, and that he exhibits no visible evidence, lesions or symptoms of diphtheria, scarlet fever, open tuberculosis, dysentery, typhoid fever, syphilis, gonorrhoea or other communicable disease. Laboratory specimens may be taken by the examining physician, but for the sake of uniform technique it is preferred that specimens be taken by the county health officer. Full-time health officers shall make no charge for taking laboratory specimens. Nose and throat swabs, sputum, and feces and urine specimens are required as a routine; where venereal infection is suspected, blood for a Wassermann, or smears for gonococcus, as the case may be, shall also be taken

# APPENDIX VII

## A CHART FOR TEACHERS

### Contagious Diseases of Children

| Disease | Early symptoms | Site of eruption | Character of eruption or symptoms |
|---|---|---|---|
| Scarlet fever........ | Sore throat, high fever, chills, vomiting, swelling of neck glands | Face, abdomen and wrists; spreads rapidly | Fine scarlet points, soon running together to form a scarlet rash |
| Diphtheria......... | Sore throat, headache, tender at angle of jaw | Throat and nose | Dirty white membrane in throat; sometimes in nose |
| Measles............ | Running nose, inflamed eyes, fever, cough | Face, spreading downward over body | Small, dark-pink spots tending to group themselves in crescents |
| Chickenpox........ | Slight fever, sometimes headache | Chest, back and body generally | Successive crops of watery pimples that form scabs |
| Mumps............ | Fever, headache, dry skin, rapid pulse | At angle of jaw, sometimes under jaw | Swelling, tenderness, painful swallowing |
| Whooping cough... | Cough, growing worse, hard and ringing | ..................... | Spasmodic cough followed by crow on taking breath, vomiting |
| Smallpox.......... | Chills, fever, vomiting, intense headache and backache | Face, neck, trunk, limbs, especially toward hands and feet | Hard pimples, thin, pustular, with pit in center, thin scabs |
| German measles.... | Swelling of neck glands, and tenderness, fever, sore throat | Face and chest, spreading rapidly | Rose-colored spots on first day |

Symptoms Which Should Make One Suspicious of Commencing Contagious Disease

1. Disisnlination to play or study
2. Unuucal "tired feeling"
3. Drowsiness
4. Lack-lustre eyes
5. Cheeks flushed or pallid
6. Chills
7. Vomiting
8. Cough
9. Sweating
10. Eruption on skin
11. Discharges from nose, throat or ears
12. Swelling in neck
13. Eyes red or inflamed
14. Eyes discharging
15. Sore throat
16. Fever

## APPENDIX VIII

### A. TECHNIQUE OF SCHICK TEST

The following technique for performance of the Schick Test, to determine immunity to diphtheria, is taken entirely from Rosenau's Preventive Medicine and Hygiene, Pages 1497–1498, Fourth Edition, D. Appleton & Co., New York.

"THE SCHICK TEST

"*Object.*—To determine the presence or absence of diphtheria antitoxin in the blood of the subject under test.

"A minute quantity of toxin (1/50 M.L.D.) is injected intracutaneously and a local reaction follows if there is less than 1/30 of a unit of antitoxin per c.c. of blood. The explanation of the test is that when antitoxin is present, the toxin is neutralized and no injury to the tissues occurs. A negative reaction therefore indicates the presence of antitoxin (*immunity*). A positive reaction indicates the absence of antitoxin (*susceptibility*).

"Diphtheria toxin is diltued so that 0.1 c.c. equals 1/50 of the M.L.D. for a 250-gram guinea-pig. This amount (0.1 c.c.) is injected with a 1 c.c. syringe and fine needle *intra*cutaneously on the flexor surface of the forearm or arm. A good guide for the insertion of the needle into the proper layer of the skin is to be able to see the oval opening of the needle through the superficial layers of the epidermis. A properly made injection is recognized by a distinct wheal-like elevation, which moves with the skin, and shows the prominent openings of the hair follicles. The results of the test should be read and noted daily.

"The reaction that results at site of injection may be either positive, negative, pseudo, or combined positive and pseudo.

"(1) *Positive.*—Trace of redness in 12 to 24 hours. Distinct in 24 to 48 hours. Reaches height on 3rd to 4th day. Leaves circumscribed scaling area of brownish pigmentation which persists for 3 to 6 weeks.

"(2) *Negative.*—No reaction at site of inoculation.

"(3) *Pseudo.*—Local anaphylactic response of the tissue cells due to the protein substances which are present in the toxic broth used for the test. Reaction appears early—in from 6 to 18 hours—reaches its height in 36 to 48 hours, disappears on the 3rd or 4th day. There is generally no scaling. At its height, the pseudo reaction shows varying degrees of infiltration and appears as a small central area of dusky redness with a secondary areola, which gradually shades off into the surrounding skin. The reaction may also have a rather uniform appearance and be two to three times the size of a true reaction. Compare with control.

"(4) *Combined.*—Positive and pseudo reaction in the same individual. The central area of redness is larger and better defined, the amount of infiltration is also more marked, a definite area of scaling brownish pigmentation is observed after the pseudo element has disappeared in the test.

"Pseudo, combined and doubtful reactions, in the absence of suitable controls should be regarded as positive to be on the safe side.

"*Control.*—With toxin heated to 80° C. for 30 minutes, or with toxin neutralized with antitoxin, to help interpretation."

## B. DISINFECTION METHODS

Much might be said on the details of disinfection, but a few brief rules will meet all practical requirements of a small health department. In fact, the whole subject is summed up in the statement by Rosenau that, "Dryness, sunlight and cleanliness are the keynotes of sanitation in the modern acceptation of the term." Given these factors, no pathogenic organism can long retain its virulence and usually dies very quickly, with the exception of the few spore-formers. We may divide the methods of disinfection according to the materials or places to be treated.

1. *Eating utensils, clothing, washable bedding.*

(a) Boil for 10 minutes, or expose to steam under *pressure* of 15 pounds for 5 minutes.

(b) Some of these things can be baked in a hot oven for 20 minutes without injury.

(c) Soaking for 2 hours in a 5 per cent. solution of formaldehyd or bleaching powder is also effective.

2. *Bedding and clothing that cannot be boiled.* Expose to the direct rays of the sun for 8 hours, turning them occasionally so that all parts are reached by the sun. This applies to mattresses, pillows, blankets, quilts, woolen and silk clothing, especially. It may also be applied to toys and books that are not to be destroyed.

3. *Floors, walls, furniture.* Scrubbing thoroughly with soap and hot water, followed by airing for a day or two, is all that is needed. It is only necessary to wash the walls to a point as high as that reached by particles of sputum that may have been sprayed out by the patient in coughing or sneezing.

4. *The patient* should have a hot bath and shampoo and should put on clean clothing, before leaving his room.

5. *The nurse* should make a change of clothing at the same time.

6. *Discharges and secretions from the patient.*

(*a*) Whenever possible, these should be burned very promptly.

(*b*) Soaking for three or four hours in a 5 per cent. formaldehyd solution or a fresh solution of bleaching powder will be effective, provided the mixture is frequently stirred in order to secure complete penetration. This is especially important with feces and sputum.

The above suggestions will usually be all that is required for either concurrent or terminal disinfection, in a case of communicable disease in a home or institution, provided they are *thoroughly* applied.

It will be noted that nothing is said of fumigation. The reasons for this have been given elsewhere. If it happens that the disease is one carried by insects, it will then be necessary to fumigate in order to destroy those that remain about the sickroom. The best and most easily applied insecticide is sulphur dioxid gas, generated by burning dry sulphur. Following is the method usually employed.

(*a*) Remove all movable articles from the room, after disinfection.

(*b*) Metals and paint may be coated over with vaseline to prevent corrosion or tarnishing.

(*c*) Measure out 3 or 4 pounds of powdered sulphur for each 1000 cubic feet of space.

(*d*) Provide sufficient metal pots or trays so that there will be no more than 30 pounds of sulphur to each. Put the sulphur in these containers, heaping it up in a cone-shaped pile, and set each container in a large tub or pan of water. Do not allow the bottom of the container to rest on the bottom of the vessel holding the water.

(*e*) Seal all cracks and crevices in the room.

(*f*) Drop a small piece of rag or cotton, soaked in kerosene, or alcohol, on top of each pile of sulphur. When all are ready, ignite each one, starting with those farthest from the door.

(*g*) When all are burning, close the door and place wet cloths over the cracks, or hang a wet sheet over the entire door frame.

(*h*) Keep watch for fire originating from the burning sulphur.

(*i*) Leave room closed for at least 8 hours.

## C. DELOUSING METHODS

The following technique for delousing under varying conditions is extracted from Rosenau's Preventive Medicine and Hygiene, Pages 366–369, Fourth Edition, D. Appleton & Co., New York.

"**Delousing.**—The best delousing methods should not only destroy lice and their eggs, but also the viruses transmitted by the insect. Fortunately, the viruses of relapsing fever, typhus fever and trench fever are comparatively frail; they are destroyed at 70°C. moist heat for 30 minutes. Lice and nits are killed at this temperature; also at 55°C. dry heat in 5 minutes. It is a comparatively simple matter to kill lice and their nits—only the administrative aspect of the problem presents any real difficulty. The most frequently used methods are heat, chemicals or storage.

"*Heat.*—Dry heat is convenient, but not effective in large scale operations because it lacks the power of penetration. Dry heat has the advantage in the case of leather material and rubber goods, which may be thus disinfested without injury. Shoes are rarely infested; in fact, leather and rubber articles as a rule need not be treated except in the presence of heavy infestations or an epidemic. Steam penetrates better, is quicker, surer; and it also disinfects.

"Heat may be applied in a great variety of ways: boiling water, Serbian barrel, steam, flat iron, hot oven, hot air boxes or huts, steam disinfectors.

"The *flat iron* was employed in some armies. The method is effective, but impracticable on a large scale as it is time-consuming. If used in connection with a delousing plant, the number of ironers would have to equal the number of bathers so that the clothes would be ready for the men when they came out of the bath. It takes about 15 minutes to iron a uniform and underclothes.

"*Hot ovens* have been used. This method may be applied on a small scale. Care must be observed not to scorch the clothing. A very effective hot air method is the hot air hut, described by Captain Orr of the Canadian Army. The penetration with dry heat is not as complete as when using steam. Stagnant hot air is less effective than circulating hot air. In the front area, in dugouts and trenches, the hot box may be used. This box is based on the principle of the fireless cooker, and used by heating a piece of metal, and placing the clothing, which is protected from coming in contact with the metal, over it. The temperature obtained is sufficient to destroy lice and eggs.

"*Hot water.*—Lice and eggs immersed in water at 70°C. for 30 minutes are killed with certainty—this method is not practical on a large scale.

* * * * *

"*Steam Disinfectors.*—The large commercial steam disinfectors are the best and quickest way of delousing large quantities of clothing. With the aid of the vacuum, penetration is sure and the materials are both disinfested and disinfected. Steam may also be used in improvised methods in a freight car, obtaining the steam from the locomotive; or in the compartments of a ship.

"The *steam laundry* is a good delousing apparatus, provided live steam is run into the wash wheel. It takes about 15 minutes to insure a proper temperature.

"Clothing can be freed of lice by *storage*. Sufficient length of time must elapse for the adult lice to die and nits to hatch. Nuttall advises clothing stored in a dry temperature for two to three weeks. Since hatching has been delayed thirty-five days by low temperature, it would be safe to allow thirty to forty days during cool weather.

"*Chemicals* are used for two purposes; to destroy lice and nits on clothing and hair, or to repel them. Numerous licicides have been recommended, but experience has shown most of them to be worthless; they may destroy lice, but rarely do they destroy nits.

"The most effective insecticides for louse control are kerosene, naphthalene, carbon bisulphid and lysol. The English employed the N.C.I. powder with some success. This consists of

| | |
|---|---|
| Naphthalene | 96 per cent. |
| Creosote | 2 per cent. |
| Iodoform | 2 per cent. |

"The commercial naphthalene is the best. This powder acts as a repellent; therefore it should be dusted into the clothing frequently—every three days. The best results are obtained by dusting the seams of the clothing freely and then rolling in a blanket. Care must be exercised in using the powder in the fork of the trousers, as it may cause smarting. Some observers have had just as good results with crude naphthalene. A powder consisting of talc, 20 gms., creosote, 1 c.c., sulphur, 0.5 gms., has been suggested by Moore, and is supposed to be effective. It causes less irritation to the skin than the N.C.I. powder.

"In conjunction with the N.C.I. powder, the English use a mixture known as Vermijelli, which consists of:

| | |
|---|---|
| Crude mineral oil | 5½ pints |
| Soft soap | 3 lbs. |
| Water | About ½ pint |

"This is smeared in the interior seams of the clothing. Impregnation of underclothing with various chemicals has given unsatisfactory results. Sachets are only effective for a short time.

"Various *fumigation methods* have been recommended, but experience has shown that most of the gases do not destroy nits. The value of sulphur and formaldehyd has been overestimated. Nits are not destroyed. The use of hydrocyanic acid gas has been recommended, and it was found that 3 ounces to 3½ ounces per 100 cubic feet would be sufficient to kill adult lice and to prevent eggs from hatching, when the surface of the clothes are freely exposed to the fumes for one-half hour."

# APPENDIX IX

## FORMS

The following forms are offered as suggestions. They have been in actual use in small health departments and have given satisfaction. None of them should be followed blindly, but each item should be most carefully studied in relation to the peculiarities of local conditions. Following through a series of cases, in imagination, the health officer can frequently discover where he may wish to make changes, before he has gone to the expense of printing rather costly forms. This may make quite a difference in a small budget. See Part I, Chapter IV.

## FORM I

### Communicable Disease Card—Face

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

**PALO ALTO HEALTH DEPARTMENT**
**Record of Communicable Disease**

Case No. . . . . . . . . . . . . . .
Age. . . . . . . . . . . . . . . . . .
Sex. . . . . . . . . . . . . . . . . .

Disease. . . . . . . . . . . . . . . . . . . . . . . . Color. . . . . . . . . . . . . . . . .
Name. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
Residence. . . . . . . . . . . . . . . . . . . . . . . . . . . Phone. . . . . . . . . . . . . . .
School or Occupation. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
Date Reported. . . . . . . . . . . . . . . . . . . . . . Physician. . . . . . . . . . . . . . . . . . . .
Quarantine. . . . . . . . . . . . . . . . Isolation. . . . . . . . . . . . Placard. . . . . . . . . . . . . .
Date First Symptoms. . . . . . . . . . . . . . . . . . . . Date Exanthem. . . . . . . . . . . . .
Last Day Attended School or Business. . . . . . . . . . . . . . . . . . . . . . . . . . . . .
Laboratory Examinations. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
Is Nurse Isolated with Case. . . . . . . . . . . . . . . . Removed to Hospital. . . . . . . .
Previous Attack. . . . . . . . . . . . . . . . . . . . . . . . Vaccination. . . . . . . . . . . . . . .
Milk Supply. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
Library Books. . . . . . . . . . . . . . . . . . . . . . . . . . Laundry. . . . . . . . . . . . . . . . .
School Notice. . . . . . . . . . . . . . . . . . . . . . . . . . State Notice. . . . . . . . . . . . . .
Died—Released. . . . . . . . . . School Permit. . . . . . . . . . Disinfected. . . . . . . . . .

(over)

Note dates at top. A small metal signal can be slipped over the date on which the next action is required in the case and the cards filed alphabetically or numerically.

## Communicable Disease Card—Reverse

PERSONS EXPOSED TO PATIENT

| Name | Age | School or Occupation | Address |
|---|---|---|---|
| .................... | ..... | ........................ | ...................... |
| .................... | ..... | ........................ | ...................... |
| .................... | ..... | ........................ | ...................... |
| .................... | ..... | ........................ | ...................... |
| .................... | ..... | ........................ | ...................... |
| .................... | ..... | ........................ | ...................... |

OTHER DATA:

..........................................................................

..........................................................................

..........................................................................

..........................................................................

..........................................................................

..........................................................................

..........................................................................

..................................................Inspector.

# FORM II

## Laboratory Record Card

To be sent to laboratory with the specimen.

**CITY OF PALO ALTO**
**CLINICAL LABORATORY**
**PALO ALTO HOSPITAL**

No....................

Date....................19......

Physician............................Address........................

Patient............................Address........................

Specimen..................................................

To be examined for............................................

Diagnosis.................................................

Remarks.................................................

..................................................

..................................................

..................................................

..................................................

| | | | |
|---|---|---|---|
| Charges.......... | ....... | ....... | Reported...................... By phone, mail, in person. |
| .................. | ....... | ....... | |
| .................. | ....... | ....... | .............................. |

Bacteriologist.

## FORM III

### Notice to Exclude from School

This form was printed in red to attract attention.

# CONTAGIOUS DISEASE—WARNING

PALO ALTO BOARD OF PUBLIC SAFETY
HEALTH DEPARTMENT

.........................................

Palo Alto Public Schools:
You are instructed to exclude from school
.................................................until further notice.
..............has been exposed to...................................
has contracted
Please notify the teacher.
Respectfully,

.............................................
Health Officer.

## FORM IV

### Permit to Return to School

# CONTAGIOUS DISEASE—PERMIT

PALO ALTO BOARD OF PUBLIC SAFETY
HEALTH DEPARTMENT

.........................................

Palo Alto Public Schools:
Kindly Permit

.......................................................................
to attend school.

Respectfully,

.........................................
Health Officer.

# FORM V

## Weekly Report of Morbidity

Mailed each week to the press, to physicians and others interested.

HEALTH DEPARTMENT
**WEEKLY MORBIDITY REPORT**
PALO ALTO CALIFORNIA

*For the week ending Saturday*....................................

| Disease | Cases under isolation | Cases reported during week | Cases released during week | Cases under isolation |
|---|---|---|---|---|
| Anthrax.................... | | | | |
| Cerebrospinal meningitis....... | | | | |
| Chickenpox................. | | | | |
| Diphtheria.................. | | | | |
| Erysipelas.................. | | | | |
| German measles.............. | | | | |
| Gonococcus infection.......... | | | | |
| Influenza................... | | | | |
| Leprosy.................... | | | | |
| Malaria.................... | | | | |
| Measles.................... | | | | |
| Mumps..................... | | | | |
| Plague..................... | | | | |
| Pneumonia.................. | | | | |
| Poliomyelitis................ | | | | |
| Rabies..................... | | | | |
| Scarlet fever................ | | | | |
| Smallpox................... | | | | |
| Syphilis.................... | | | | |
| Tetanus.................... | | | | |
| Tuberculosis................ | | | | |
| Typhoid fever............... | | | | |
| Typhus fever................ | | | | |
| Whooping cough.............. | | | | |
| Other...................... | | | | |
| ........................... | | | | |

Births reported.....................
Deaths reported.....................

..............................
Health Officer

## FORM VI

### Daily Record or Diary

This might be printed on a sheet $5\frac{1}{2}'' \times 8\frac{1}{2}''$ and the remainder of the space used for a narrative report or notes. If a weekly or monthly report is to be made to the state health department, or other agency, this form should be checked against the one used for such reports, before being adopted.

## DAILY RECORD

Name Date

| | Number | Time | |
|---|---|---|---|
| Inspections: | | | |
| Dairy.............................. | | | |
| Disease.............................. | | | |
| Food supplies.............................. | | | |
| Sanitary.............................. | | | |
| School.............................. | | | |
| Laboratory: | | | |
| Diagnosis.............................. | | | |
| Food.............................. | | | |
| Milk.............................. | | | |
| Water.............................. | | | |
| Office: | | | |
| Correspondence.............................. | | | |
| Records.............................. | | | |
| Reports.............................. | | | |
| Conferences.............................. | | | |
| Examinations.............................. | | | |
| Home visits.............................. | | | |
| Vaccinations.............................. | | | |
| .............................. | | | |
| Mileage.............................. | | | |
| Totals.............................. | | | |

Health Department, Palo Alto, Calif.

# FORM VII

## Combined Complaint and Inspection Record and Notice to Abate Nuisance

Original on white paper, duplicate on yellow, and bound in pads. Punched for ring binder. Size of sheets $8\frac{1}{2}'' \times 11''$.

**DEPARTMENT OF HEALTH** No.........

**CITY OF SAN JOSE** Date.........192....

**CALIFORNIA** Hour.....A. M., P. M.

**INSPECTION AND COMPLAINT RECORD**

| | | |
|---|---|---|
| **COMPLAINT—** | Complainant | Defendant |
| Verbal | Address | Address |
| Phone | Telephone | Telephone |
| Letter | | |

Nature of Complaint..........................................................

..........................................................................................

..........................................................................................

..........................................................................................

Received by.............................Referred to..........................

**INSPECTION NOTES:**—Location of Premises.......................................

Premises owned by.........................................................................

Premises occupied by....................................................................

..........................................................................................

..........................................................................................

..........................................................................................

..........................................................................................

..........................................................................................

Date Inspected................192..., .....A. M., P. M., Inspected by...........

Notice to abate given..........................192.. in person, mail, phone.

**NOTICE TO ABATE**

You.............................................................. { owner / agent / occupant

of the above described premises, are hereby directed to abate the above described nuisances or violations of law prior to.................., 192.... in the following manner:..........

..........................................................................................

..........................................................................................

..........................................................................................

Failure to abate the above nuisances or violations of law is a misdemeanor, punishable by fine or imprisonment. This is the..............notice.

......................., Health Officer

by..................................

.......................................

| | |
|---|---|
| I hereby acknowledge receipt of the above notice, this........... ........day of .................., 192......... | Reinspection............. 192............ |
| | Reinspection............. 192............ |
| | Reinspection............. 192............ |
| ........................... | Final Inspection.......... 192............ |
| (Signature) | Date of Abatement....... 192............ |

# FORM VIII

**Continuous Record of Physical Examination of School Child**

This record is sent with child's other papers to each new grade or school entered. Size of sheet $8\frac{1}{2}'' \times 11''$.

PALO ALTO HEALTH DEPARTMENT

## RECORD OF PHYSICAL EXAMINATION

Name ................ Surname ................ Given name ................ Date of birth ................

Residence ................ (date) Father ................ Name ................ Nationality

Residence ................ (date) Mother ................ Name ................ Nationality

Residence ................ (date) ................

Residence ................ (date) ................

| Date | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| School | | | | | | | | | |
| Grade | *K* | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1 Age | | | | | | | | | |
| 2 Weight | | | | | | | | | |
| 3 Height | | | | | | | | | |
| 4 Vision | | | | | | | | | |
| 5 Hearing | | | | | | | | | |
| 6 Tonsils | | | | | | | | | |
| 7 Adenoids | | | | | | | | | |
| 8 Glands | | | | | | | | | |
| 9 Teeth | | | | | | | | | |
| 10 Nerves | | | | | | | | | |
| 11 Nutrition | | | | | | | | | |
| 12 Skin | | | | | | | | | |

| Communicable Diseases (note date of each) | | Remarks |
|---|---|---|
| Chickenpox | Pneumonia | |
| Diphtheria | Scarlet fever | |
| German measles | Smallpox | |
| Influenza | Typhoid fever | |
| Measles | Whooping cough | |
| Mumps | | |

Examiner

# FORM IX

## Report to Dairyman on Results of Milk Examinations

Board of Public Safety
Palo Alto, Cal. ..............................
Health Department
Samples from..........................................................

| Month | Day | Milk or cream | Bacteria per cc. | Milk fat | Solids not fat | Remarks |
|---|---|---|---|---|---|---|
| ......... | ...... | ....... | .............. | ....... | ....... | .............. |
| ......... | ...... | ....... | .............. | ....... | ....... | .............. |
| ......... | ...... | ....... | .............. | ....... | ....... | .............. |
| ......... | ...... | ....... | .............. | ....... | ....... | .............. |
| ......... | ...... | ....... | .............. | ....... | ....... | .............. |
| ......... | ...... | ....... | .............. | ....... | ....... | .............. |
| ......... | ...... | ....... | .............. | ....... | ....... | .............. |

CITY ORDINANCE REQUIRES:

| | | |
|---|---|---|
| Guaranteed Milk..... | Bacteria per cc., 20,000, or less; | Fat 3.8 per cent |
| Guaranteed Cream... | | Fat 25.0 per cent |
| Grade A cream...... | | Fat 18.0 per cent |
| Grade A Raw Milk... | Bacteria per cc., 100,000, or less; | Fat 3.4 per cent |
| Grade A Pasteurized. | Bacteria per cc., 10,000, or less; | Fat 3.4 per cent |

.........................................

Health Officer

# FORM X

## Dairy Cow Record—Face

### PALO ALTO HEALTH DEPARTMENT

TUBERCULIN TEST RECORD

Owner........................................................................

Tag No................................Temporary No..................

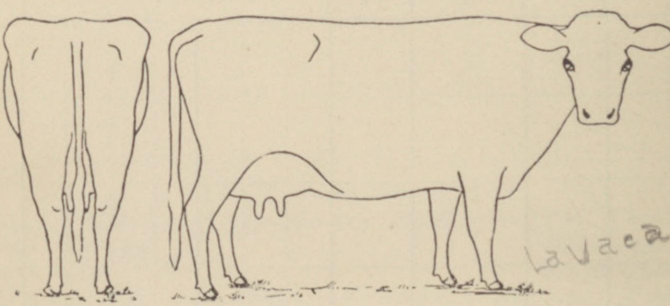
Breed.................................Color.............................

| Date | Kind of test | Veterinarian | Tuberculin amount, etc. | Time injected | Temperatures before and after, description of swelling, etc. | | | | | | | Result |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

### Dairy Cow Record—Reverse

Diagram of cow is used for indicating identifying marks or areas of color.

Owner..........................................................................................<br>
Tag No.............................. Temporary No..........................<br>
Breed................................ Height.....................................<br>
Color................................. Brands....................................<br>
Remarks.......................................................................................<br>
..................................................................................................



# FORM XI

For tabulating causes of death, by months, using the short list of causes.

| | Regis. District.................................<br>Period.......................................<br>Cause of death | Total | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | All causes | | | | | | | | | | | | | |
| 1 | Typhoid fever (1).................................... | | | | | | | | | | | | | |
| 2 | Smallpox (6).......................................... | | | | | | | | | | | | | |
| 3 | Measles (7)........................................... | | | | | | | | | | | | | |
| 4 | Scarlet fever (8)..................................... | | | | | | | | | | | | | |
| 5 | Whooping cough (9).................................... | | | | | | | | | | | | | |
| 6 | Diphtheria (10)....................................... | | | | | | | | | | | | | |
| 7 | Influenza (11)........................................ | | | | | | | | | | | | | |
| 8 | Other epidemic diseases (2–5, 21–30, 41–42)............ | | | | | | | | | | | | | |
| 9 | Tuberculosis of lungs (31)............................. | | | | | | | | | | | | | |
| 10 | Tuberculosis other organs (32–37)..................... | | | | | | | | | | | | | |
| 11 | Venereal infections (38–40)........................... | | | | | | | | | | | | | |
| 12 | Cancer (43–49)........................................ | | | | | | | | | | | | | |
| 13 | Other general diseases (50–69)........................ | | | | | | | | | | | | | |
| 14 | Meningitis (71)....................................... | | | | | | | | | | | | | |
| 15 | Other diseases nervous system (70, 72–86)............. | | | | | | | | | | | | | |
| 16 | Diseases of the circulatory system (87–96)............ | | | | | | | | | | | | | |
| 17 | Pneumonia (100–101)................................... | | | | | | | | | | | | | |
| 18 | Other diseases of respiratory system (97–99, 102–107)..... | | | | | | | | | | | | | |
| 19 | Diarrhea and enteritis under 2 years of age (113)......... | | | | | | | | | | | | | |
| 20 | Other diseases digestive system (108–112, 114–127)....... | | | | | | | | | | | | | |
| 21 | Diseases genito-urinary system (128–142).............. | | | | | | | | | | | | | |
| 22 | Childbirth (143–150).................................. | | | | | | | | | | | | | |
| 23 | Diseases early infancy (159–163)...................... | | | | | | | | | | | | | |
| 24 | Suicide (165–174)..................................... | | | | | | | | | | | | | |
| 25 | Other violence (175–203).............................. | | | | | | | | | | | | | |
| 26 | All other causes (151–158, 164, 204–205).............. | | | | | | | | | | | | | |

State of New Mexico, Bureau of Public Health

# APPENDIX X

## BIBLIOGRAPHY

Quite in keeping with the growth of sanitary science, the last few years have seen an increasing stream of literature upon all subjects touching this broad field. To give anything approaching a complete bibliography would only serve to confuse the student who is gaining his first impressions through the medium of books. On the other hand, it has been difficult to make a selection among the various excellent works that are offered. Probably no two bibliographers would agree upon recommendations, but the authors offer here a list that they believe will meet all requirements of the average health officer. Indeed, a thorough assimilation of even a few of these books will furnish a solid foundation of knowledge in the science and art of sanitary practice and will open up new vistas that the student can follow more carefully as his tastes dictate.

Valuable suggestions and helpful literature can be secured from the following sources:

American Child Health Association, 370 7th Avenue, New York City.
American Public Health Association, 370 7th Avenue, New York City.
American Social Hygiene Association, 370 7th Avenue, New York City.
American Society for the Control of Cancer, 25 W. 45th St., New York City.
National Committee for the Prevention of Blindness, 130 E. 22d St., New York City.
National Health Council, 370 7th Avenue, New York City.
National Tuberculosis Association, 370 7th Ave., New York City.
National Headquarters, American Red Cross, Washington, D. C.
U. S. Public Health Service, Washington, D. C.

The following books and pamphlets can be secured through the American Public Health Association, or direct from the publisher or book seller. Those marked with an asterisk (*) will be especially helpful to the beginner.

## GENERAL PREVENTIVE MEDICINE AND HYGIENE

Boyd, Preventive Medicine.
Chapin, How to Avoid Infection.
* Chapin, The Sources and Modes of Infection.
Darlington, Health and Efficiency.
Fitzgerald, An Outline of the Practice of Preventive Medicine.
Jenkins, Health and Disease.
Nichols, Carriers in Infectious Diseases.
* Park, Public Health and Hygiene.
* Rosenau, Preventive Medicine and Hygiene.
* Simon, Human Infection Carriers.
Simon, Infection and Immunity.
Vaughan, Epidemiology and Public Health.

## ADMINISTRATION, PUBLICITY AND SOCIAL MEDICINE

* Brend, Health and the State.
Byrd, Forty Notifiable Diseases.
Davis & Warner, Dispensaries: Their Management and Development.
* Horwood, Public Health Surveys.
* MacNutt, A Manual for Health Officers.
Morgan, Public Relief of Sickness.
National Health Council, List of Health Films.
Red Cross, Handbook of Social Resources.
Richmond, What is Social Case Work?
Routzahn, Traveling Publicity Campaigns.
* Routzahn & Routzahn, The A-B-C of Exhibit Planning.
Whipple, State Sanitation.

## LABORATORY

d'Herelle, The Bacteriophage.
Kolmer, Infection, Immunity, Specific Therapy.
Rivas, Parasitology.
A.P.H.A., Standard Methods for Examination of Water.
A.P.H.A., Standard Methods for Examination of Milk.
* Stitt, Practical Bacteriology.

## MATERNAL, CHILD AND SCHOOL HYGIENE

* Baldwin, Physical Growth of Children from Birth to Maturity.
Eve, Manual for Health Visitors and Infant Welfare Workers.
* Holt, The Care and Feeding of Children.
MacCarthy, The Healthy Child from Two to Seven.
Milnes, Child Welfare.
Van Blarcom, Obstetrical Nursing.

### FOOD AND NUTRITION

Chittenden, The Nutrition of Man.
Kilbourne, The Pasteurization of Milk.
* Lusk, Elements of the Science of Nutrition.
* McCollum, The Newer Knowledge of Nutrition.
* North, Farmers' Clean Milk Book.
Rosenau, The Milk Question.

### SANITARY ENGINEERING AND SANITATION

* Howard, The House Fly.
Kinnicutt, Winslow & Pratt, Sewage Disposal.
Metcalf & Eddy, American Sewerage Practice (3 vols.).
* Metcalf & Eddy, Sewerage and Sewage Disposal.
Ogden, Rural Hygiene.
Pierce, Sanitary Entomology.
Whipple, The Microscopy of Drinking Water.

### INDUSTRIAL MEDICINE AND HYGIENE

* Clark, Health Service in Industry.
Dawson, Frankel & Dublin, Workingmen's Insurance in Europe.
Fed. Am. Engineering Societies, Waste in Industry.
Goldmark, Fatigue and Efficiency.
* Kober & Hanson, Diseases of Occupation and Vocational Hygiene.
Tead & Metcalf, Personnel Administration.

### VITAL STATISTICS AND BIOMETRY

Chapin, Field Work and Social Research.
Davenport, Statistical Methods With Special Reference to Biological Variation.
* King, Elements of Statistical Method.
Newsholme, Elements of Vital Statistics.
Population and Its Distribution.
* Pearl, The Biology of Death.
* Whipple, Vital Statistics.
Yule, Introduction to the Theory of Statistics.

### MENTAL HYGIENE AND PSYCHOLOGY

* Cotton, The Defective, Delinquent and Insane.
Dewey, Human Nature and Conduct.
Drever, Psychology of Everyday Life.
Franz, A Handbook of Mental Examination Methods.
* White, The Mental Hygiene of Childhood.
* White, Principles of Mental Hygiene.

## SOCIAL HYGIENE AND EUGENICS

Clarkson, The Venereal Clinic.
* Exner, The Rational Sex Life for Men.
* Funk, Vice and Health.
* Galloway, Biology of Sex for Parents and Teachers.
* Galloway, The Sex Factor in Human Life.
* Kneeland, Commercialized Prostitution in New York City.
Popenoe & Johnson, Applied Eugenics.
Stokes, The Third Great Plague.
* Stokes, Today's World Problem in Disease Prevention.
Woolston, Prostitution in the United States.

## TUBERCULOSIS

Calmette, Tuberculosis.
Walters, Domiciliary Treatment of Tuberculosis.
Jacobs, The Tuberculosis Worker.
Krause, Environment and Resistance in Tuberculosis.

## OTHER DISEASES

Dock & Bass, Hookworm Disease.
Hoffman, Mortality from Cancer throughout the World.
Ker, Infectious Diseases.
* Stitt, Diagnosis and Treatment of Tropical Diseases.
Turner, Ringworm among School Children and Its Treatment.
Vaughan, Influenza: An Epidemiological Study.

## NURSING

Brainard, The Evolution of Public Health Nursing.
Brainard, The Organization of Public Health Nursing.
* Gardner, Public Health Nursing.
Porter, Applied Psychology for Nurses.
Price, Hygiene and Sanitation for Nurses.
Van Blarcom, Obstetrical Nursing.

## PERSONAL HYGIENE

* Fisher & Fisk, How to Live.
Rucker, Ten Talks to Girls on Health.

## HEALTH EDUCATION FOR CHILDREN

Andress, The Teaching of Hygiene in the Grades.
Andress & Andress, The Story of Rosy Cheeks and Strong Heart.
* Griffith, Cho-Cho and the Health Fairy.
O'Shea & Kellogg, Building Health Habits.

* Peterson, The Child Health Alphabet.
* Ritchie, Primer of Hygiene.

(The above list is taken largely from "Books for Sanitarians" issued by the American Public Health Association.)

## PERIODICALS DEALING WITH PUBLIC HEALTH

American Journal of Public Health, American Public Health Ass'n, 370 7th Avenue, New York City.

The Public Health Nurse, National Organization for Public Health Nursing, 370 7th Avenue, New York City.

The Nation's Health, Hospital Publishing Co., Chicago, Ill.

Hygeia, American Medical Association, 535 N. Dearborn St., Chicago, Ill.

# INDEX

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