THE CARRIERS OF DISEASE

PREPARED FOR USE IN
THE DEPARTMENT OF HYGIENE
IN
THE COLLEGE OF THE CITY OF NEW YORK

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PART TWO

THE CARRIERS OF DISEASE
INTRODUCTORY

Every young human owes it to himself and to society of which he is a part, to get ready for the duties and the experiences of citizenship. You as college students have a greater obligation to be prepared because of the educational opportunities that are open to you. As sons of the city and as matriculates of the city's college you have not only an obligation—you have in addition a responsibility. Your obligation is to make yourself physically fit; to make yourselves physiologically sound; and to make yourselves vigorously and enduringly healthy. Your responsibility is to use your educated body and your educated mind to meet fully, completely and intelligently the demands of citizenship in peace or in war for the lasting benefit of your country, your State, your city, and yourself.

Your State and your city have provided opportunities in this college for your training. The college will do its utmost to give you the best service it affords—but the success of your training here depends upon you. After all has been furnished that can be furnished by the college and by the city and the State back of the college, you and you alone can make your training season here a success.

The Department of Hygiene is concerned with your health—the most important asset you can possess. If you will make intelligent use of the opportunities provided in this department you will acquire habits of health information, habits of bodily care and repair, habits of health protection, and habits of constructive hygiene that will enable you to achieve and conserve your full growth and full bodily development, and to acquire a vigorous health resource that will conserve your productive life for service to yourself and for service to society.

One of the very important problems of health protection is the problem of avoiding the carriers of disease. Every plan for the acquisition and the conservation of individual health and of community health must include wise provisions for the destruction, isolation, and avoidance of pathogen carriers. The health talks of this term will be concerned with these carriers.

These talks will be worth while if you will make them your own. They will be useful if you will make health habits out of them. Their
service for the protection of your health and for the conservation of your vital resources depends wholly upon you. They will help you meet your obligations and carry your responsibilities to the citizenship for which you are getting ready if you will use them.

II

MAN AS A CARRIER OF PATHOGENS

When we remember that only a few pathogenic organisms reproduce in nature, and that all forms under favorable conditions will live and reproduce in the human body, we are forced to the conclusion that man himself is the most important and the most dangerous disease carrier. Man is a carrier of disease because of the pathogenic organisms which he distributes about him by way of his various excretions in health, in disease, and during recovery from disease. The relation of these various excretions to the spread of disease may be outlined as follows:

Dissemination of Pathogenic Organisms by Way of the Excretions and Discharges from the Human Nose and Throat

(a) In Health.—Pus cocci, the organisms that cause boils and abscesses; streptococci, the organisms that cause severe inflammation with general toxemia (poisoning); pneumococci, the organisms that cause one form of pneumonia. They may cause other diseases than pneumonia. Diphtheria bacilli. During a certain epidemic in Middletown, Conn., over 2 per cent. of the throats of 4,081 apparently healthy individuals showed diphtheria bacilli. After the epidemic subsided over 1 per cent. of these individuals showed diphtheria bacilli. The cocci of meningitis have been found in apparently normal persons. The cause of infantile paralysis has been found in apparently normal throats. It is possible that the specific causes of the following diseases may be present in the air passages of healthy persons: Scarlet fever, measles, whooping-cough, mumps, leprosy, and tuberculosis.

(b) In disease of the nose, mouth, throat, and other upper air passages, and lungs. The organisms that cause colds in the nose, throat and lungs; influenza; bronchitis; the various sorts of pneumonia; syphilis; diphtheria; infantile paralysis; leprosy; tuberculosis, and bubonic plague. The unknown cause of measles, scarlet fever, and other diseases.

(c) During recovery from disease of the respiratory tract, and
often for some time afterward, the various organisms noted under (b) are eliminated in the excretions from the respiratory tract. Note the importance of this fact.

III

MAN AS A CARRIER OF PATHOGENS—Continued

The Dissemination of Pathogenic Organisms by Way of the Excretions and Discharges from the Nose and Throat.—(Continued)

Methods of Elimination—These organisms are carried out of the body in health and disease by sneezing, coughing, spitting, blowing the nose, forceful talking, forceful whispering, forceful breathing, and by swallowing.

Methods of Transmission.—The causes of disease contained in these discharges from the nose and mouth in health and in disease reach other people. (a) By direct transmission of organisms from one person to another, such as by droplet infection, in coughing, sneezing, and other forms of forceful breathing; by contact infection, as in kissing; contact with dirty fingers or other parts that have been smeared with these discharges; common spoon; apple core; the mother that chews her baby’s food or feeds it with her own spoon; cigar-makers that use their own saliva in rolling cigars, etc. (b) By indirect transmission by way of infected: Dust, food and drink, articles in common use, household vermin, such as rats, mice, flies, water-bugs, fleas, bed-bugs, lice, etc.

Conditions favorable to the transmission of pathogens from one person to another by way of the excretions and discharges from the nose and mouth are found in (a) Crowded living quarters. (b) Crowded transportation facilities. (c) Army camps, trenches, transports, etc. (d) Groups of people gathered for any purpose. (e) Wherever careless people are found.

The importance of the human being as a carrier of disease through the dissemination of his nasal and oral excretions and discharges is made evident by the following facts: (a) This is practically the only way in which most of these diseases are spread from one person to another. (b) These diseases represent an enormous amount of human misery, suffering, and loss of life. There are always 3,000,000 people sick in these United States. Seventeen hundred people die every day. One third of this sickness and these deaths are due to diseases spread by human beings in this manner. For example: (1) In New
York City each winter there are at least 15,000,000 cases of common cold. 

(2) In the United States there were over a hundred thousand deaths from tuberculosis in 1922. A large number of these are cases of pulmonary tuberculosis.

IV

MAN AS A CARRIER OF PATHOGENS—Continued

Dissemination of Pathogenic Organisms by Way of Discharges from the Ears and Eyes

There are no pathogenic organisms discharged in this manner in health. The middle ear and the eye drain into the nose, so in disease the ear may be affected by various pus organisms and by any of the organisms that cause disease of the nose and throat. In disease the important pathogenic organisms that are found in the discharges from the eyes are the cause of pink eye; the gonococcus; the cause of trachoma; any of the organisms that cause disease of the nose.

Means of spread of disease from these sources are towels, handkerchiefs, etc., fingers, contact.

Importance of these discharges.

Dissemination of diseases by way of discharges from the intestinal tract. The pathogenic organisms eliminated in this manner are:

In health (apparent or real). The colon bacillus is the most common inhabitant of the lower intestine. Not an actively pathogenic organism. It not infrequently becomes virulent. Present in the intestinal canal normally. The bacillus of typhoid fever has been found in the feces of apparently healthy individuals who have no history of typhoid. One investigator has isolated forty-four varieties of bacteria from forty-eight specimens of feces. Most of these forms are non-pathogenic. They include the bacillus pyrocyaneus, bacillus aerogenes capsulatus, bacillus of tuberculosis, bacillus subtilis, and other forms that are known to be pathogenic. The ameba is sometimes present. The hookworm frequently is present without symptoms. A number of less common higher-animal parasites have been found in the feces of human beings who are apparently well.

In disease. The number and variety of bacteria and protozoa is enormously increased in intestinal disease. The bacteria present may be forms already there, such as the bacillus of typhoid fever; the spirillum of cholera; the bacillus of dysentery; the tubercle bacillus. The animal
parasites present may be the ameba, the treponema of syphilis, the tape-worm, hookworm, various other parasites.

In recovery from disease, and for a greater or lesser time afterward. Probably all the organisms that cause intestinal disease. The bacillus of typhoid has been found fifty-five years after recovery of the patient.

V

MAN AS A CARRIER OF PATHOGENS—Continued

The Dissemination of Pathogenic Organisms by Way of the Discharges from the Intestinal Tract.—(Continued)

Methods of Elimination of Pathogenic Organisms from the Intestinal Tract.—In the feces. One-third of the weight of the dried feces passed by the normal individual is made up of bacteria bodies. (Stengel.) The average normal daily output by way of the bowels is estimated at 128,000,000,000 bacteria. (Strasberger.) Ninety-nine per cent. of the bacteria in normal feces are dead, but the remaining 1 per cent. may amount to many hundred millions of live bacteria. In disease the output of bacteria in the feces is enormously increased. The tape-worms, hookworms, and other animal parasites reproduce in the intestinal canal, and their eggs or offspring are then discharged in the feces. A single tapeworm may lay 150,000,000 eggs in a year.

Methods of Transmission.—The pathogenic organisms contained in the feces are conveyed to other people as follows: Directly through contact with soiled hands or other parts of the individual. Indirectly through infection of food, water, articles in common use, and infection of food animals, household pets, vermin.

Conditions favorable to the transmission of disease from one human being to another by way of the feces. (a) Bad habits of personal hygiene. (b) Poor sanitary conveniences. (c) Bad hygiene of food animals. (d) Warm, moist weather. (e) Bad domestic and community sanitation. Note the ease of transmission in trench warfare and careless camp life.

Importance of the human being as a disseminator of disease through his fecal discharges. If man would so handle the excretions from his bowels that they would not get into the food and drink of animals or other men, there would soon be no more typhoid fever, no more cholera, no more tapeworm, and no more hookworm. There were 350,000 people sick with typhoid fever in the United States in 1914. This means that human feces (or urine) had polluted the food or drink of
350,000 human beings. Thirty-five thousand died. There are some hundreds of millions of men, women and children in this world sick with hookworm. And every case has come from contact directly or indirectly with human feces. New York City has a sewer system, but flies, insects, cats, dogs, and vermin may carry their burden of disease organisms from the outlet of the sewer to your pantry and to your table. Importance of sanitary latrines in camp life and in the trenches.

VI

MAN AS A CARRIER OF PATHOGENS—Continued

The Dissemination of Pathogenic Organisms by Way of the Genito-urinary Discharges

The pathogenic organisms eliminated in this manner are: In health: Pus organisms. In disease: Bacillus of typhoid fever; the gonococcus; the treponema of syphilis; the bacillus of tuberculosis. After certain diseases (after “recovery”): Gonococcus; treponema of syphilis; typhoid bacillus.

Methods of elimination.—Through urinary and genital discharges. Methods of transmission.—By direct transmission: Contact; soiled fingers; sexual intercourse. By indirect transmission: Contamination of food and drink; articles in common use; animal and insect carriers.

Conditions favorable to transmission of disease by these routes: Poor hygiene; bad sanitation; bad community morals; military temptations and practices.

Importance of the human being as a transmitter of disease by way of his genito-urinary discharges: (a) importance of typhoid. (b) Importance of gonorrhea and syphilis. It is impossible to fully appreciate or state the importance of these venereal or so-called social diseases. They are pandemic. No country in the world is free from them. This has been true ever since the pandemic of the fifteenth century when syphilis broke out in its most hideous form in all parts of Europe. Here in New York City investigators tell us that a great many men and boys visit prostitutes every day. Every man and every boy that makes this his practice will sooner or later have syphilis, or gonorrhea, or both. There must be hundreds of thousands of persons suffering with these diseases in New York City. It has been shown in some armies in active warfare that more men have been incapacitated by venereal disease than by their human fighting enemies. The fighting strength of an army may
be reduced 20 per cent. or 30 per cent. by venereal disease unless safeguarded. (Statement of the American Social Hygiene Association, summer of 1917.) The importance of gonorrhea and syphilis arises from the following facts: (1) These diseases are universal. (2) They are associated with sin, shame, and crime. (3) They ruin the family and the home. (4) They are passed on from the guilty to the innocent. (5) Gonorrhea makes men sterile, unable to become fathers; women sterile, unable to become mothers. (6) Syphilis destroys more young and unborn infants than any other cause. (7) Gonorrhea makes more children blind than any other cause. (8) Syphilis places more men, women, and children in asylums for the insane and feeble-minded than any other cause, with the possible exception of alcohol. (9) Syphilis cripples the brain, the nerves, and the muscles. Gonorrhea cripples the joints. Both these diseases deform and incapacitate men, women, and children, mentally, morally, and physically. (10) They destroy individuals, ruin homes, demoralize communities and defeat armies.

Don't Forget.—These diseases are caused by living organisms which will grow only in human beings. These organisms are distributed from one human being to another most commonly through contact with genito-urinary excretions. The most common carrier of these diseases is the prostitute and the man of loose morals.

VII

MAN AS A CARRIER OF PATHOGENS—Continued

Dissemination of Pathogenic Organisms by Way of the Skin

The skin may mechanically carry certain organisms which live on it or in it. The most important of these organisms are pus cocci; streptococci; pathogenic contaminations from discharges from the eyes, ears, nose, mouth, rectum, genito-urinary tract, and infected wounds of the skin; and various parasitic insects.

Certain pathogens have been found in sweat, e.g., the typhoid bacillus and the tubercle bacillus. Probably not common.

Certain organisms that live in the blood may be drawn through the skin by blood-sucking insects. Some of these organisms and the insects that carry them may be enumerated as follows: (a) The plasmodium of malaria. May be present without symptoms. Carried by the anopheles mosquito. (b) The cause of dengue, carried by a mosquito. (c) The cause of yellow fever, carried by a mosquito. (d) The filaria.
There are several diseases caused by filaria. Most of them are unimportant; carried by a mosquito. (e) The trypanosome of sleeping sickness, carried by certain biting flies. (f) The cause of typhus fever, and the cause of trench fever, carried by the louse. (g) The bacillus of bubonic plague, carried by fleas. (h) The unknown cause of Rocky Mountain or spotted fever, carried by a tick.

Opportunities for blood-sucking insects to draw pathogens from the blood. (a) Organisms present in the blood in health. Cases are recorded in which malaria parasites have been present with no symptoms. Filaria usually infect with no apparent injury or discomfort to their victims. (b) Organisms present in the blood in disease. In addition to the pathogenic organisms noted above which locate themselves in the blood there are periods during infection from many other organisms during which they are present in the blood. Typhoid bacilli, tubercle bacilli, treponema of syphilis, gonococci, and other organisms have been demonstrated in the blood of patients. (c) Organisms that persist in the blood after recovery of the patient. Probably few in number. The malaria parasite may persist occasionally.

Methods of elimination.—The insects puncture the skin and suck blood containing pathogenic organisms. These organisms may simply remain alive in the puncturing apparatus or stomach of the blood-sucking insect; or they may pass through a cycle of development in the insect.

Methods of dissemination.—The insect carrier either mechanically contaminates the food of human beings, or injects the pathogenic organisms it carries into the blood of the next person it bites, or deposits pathogens on the surface of the skin.

Conditions favorable to transmission.—Congestion and poor personal hygiene favor bed-bugs, lice, etc. Bad community sanitation favors mosquitoes and flies. Poverty, because it is often accompanied by vermin. Mexico, between 1893 and 1913, has a record of 56,719 cases of typhus fever with 14,758 deaths. Army life during periods of active service favorable to vermin, such as body lice. Typhus fever one of the important diseases of armies. The Great War reported epidemics in Turkey, Servia, Russia and other countries. Trench fever, a product of the Great War, favored by life in the trenches.

Importance of human being as a disseminator of disease by way of the skin.—Malaria: 1,500,000 cases a year in the United States; 12,000 deaths, 1912. Yellow fever: In 1878 there were 132 United States towns affected, with 15,000 deaths. The epidemic represented the loss of $100,000,000. No epidemics here in recent years. Sleeping sickness has devastated whole sections of Africa, destroying the natives by the
thousand. Typhus fever at one time was the scourge of every army. Bubonic plague is a common epidemic in the Orient, and is accompanied by an enormous mortality.

VIII

**MAN AS A CARRIER OF PATHOGENIC ORGANISMS—SUMMARY**

I. Man is a carrier of disease because of the pathogenic organisms which he distributes about him in health and disease and after recovery from disease by way of his (a) Respiratory tract, including his nose, throat and mouth. (b) Eyes and ears. (c) Intestinal tract. (d) Genito-urinary tract. (e) Skin.

II. These organisms may be transferred from one person to another by (a) Direct contact ("contact infection"). (b) Secondary carriers, such as infected sewage, food, water, air (droplet infection, dust infection), dust, dirt and soil; articles and materials in common use (that is, by more than one person at a time); insects and animals.

III. When we remember that only a few forms of pathogenic organisms reproduce in nature and that all forms under favorable conditions multiply freely in the human tissues, we are forced to the conclusion that man himself is the most important and the most dangerous carrier of disease. In the great epidemics of history he has been the agent that has disseminated such diseases as cholera, typhoid fever, smallpox, yellow fever, syphilis, bubonic plague, and typhus among the nations of the earth.

IX

**INSECTS AS CARRIERS OF PATHOGENIC ORGANISMS**

*General Considerations*

*The insects* that are known to carry the organisms that cause disease are flies, mosquitoes, fleas, ticks, lice, bedbugs, water-bugs (?), cockroaches (?), kitchen ants (?).

In view of the fact that our knowledge of these carriers is only a few years old, we are forced to admit that there may be other insect carriers of whose relation to disease we are not at present aware.

*The sources from which insects secure the pathogenic organisms which they carry.*

(a) In general, it may be said that these sources are the infected
breeding-places and the infected feeding-places of insects. The significant fact in this connection is that human beings and animals are the final sources from which the pathogenic organisms come. These human and animal sources which serve as feeding-places and breeding-places for the insects that may carry the disease are the dead bodies of diseased human beings and animals (uncommon); excretions from men and animals; excretions from persons and animals while sick; excretions from such sources during recovery; excretions from such sources persisting for long periods of time after recovery, e.g., diphtheria, cholera, typhoid fever; excretions from human beings and animals that have not been sick, e.g., diphtheria, other possibilities; the living human beings and animals on which biting and blood-sucking insects feed while their blood contains pathogenic organisms; while the human or animal is sick; during recovery; for long periods after recovery, in some cases, with no evidence of any infection at any time.

(b) In particular it may be said that the organisms that cause disease may be picked up by insect carriers in the following common breeding-places and feeding-places of those insects: Garbage which may contain infectious human or animal discharges; the outlets of sewers where human excretions are found; deposits of manure, droppings from cattle, horses, swine, sheep, chickens, dogs, human beings, and other animals; hospital and sick-room wastes; the bodies of dead animals; offal from slaughter-houses, meat markets and food stores; warm, dark, damp and dirty places in which human excretions may have been left by human carriers; the dead bodies of men and animals.

INSECTS AS CARRIERS OF PATHOGENS—Continued

Ways in which Insects Carry Pathogenic Organisms

(a) Passively.—The insect that is a passive carrier of disease may carry pathogenic organisms on the outer surface of its body, as in the case of the house-fly that smears its body with the excretions from a case of typhoid fever or pulmonary tuberculosis on which it feeds. It may carry pathogenic organisms in its intestinal canal. The organisms then may pass through and escape with the excretions as in the case of the fly that feeds on the intestinal excretions of a typhoid patient or the sputum of a case of pulmonary tuberculosis.

(b) Actively or Biologically.—The insect that is an active carrier of disease becomes for a time necessary to the life of the pathogenic
organism. We say then that the pathogenic organism is a parasite and the insect is its host. An example of such an active carrier is the anopheles mosquito, which may carry the pathogenic protozoan that causes malaria.

The distribution of pathogenic organisms by insect carriers. The insect carriers distribute the organisms of disease in the following ways: (a) By wiping or shaking them off their bodies while in contact with the food or drink of human beings, or while in contact with articles in common use, or while in contact with human beings themselves. (b) By excreting them in their intestinal discharges. The mosquito usually defecates when it stings. The organism that causes trench fever is contained in the defecations of the body louse. Various pathogenic organisms have been found in the intestinal canal of the mosquito. Tubercle bacilli have been found in the feces of flies. (c) By squirting them into the blood of their victims when they sting them, e.g., the anopheles mosquito and the tsetse fly. (d) And possibly, through their remains, which may be smeared on the skin when the biting insect is crushed by a blow from the victim.

XI

INSECTS AS CARRIERS OF PATHOGENS—Continued

Special Considerations

Insects that are known to be active or biological carriers of disease:

The Ticks: Dermacentor marginatus.—Carries Rocky Mountain fever, or spotted fever. Bitter Root Valley, Colorado, mortality between 70 per cent. and 80 per cent.

Ornithodros moubata.—Carries “African tick fever,” one of the scourges of Africa.

The Biting Flies: The tsetse fly, glossina palpalis and glossina morsitans.—Carry the trypanosome of sleeping sickness discovered by Bruce and Castellani in 1902; an absolutely fatal disease; has destroyed hundreds of thousands of human beings in Africa.

Certain Mosquitoes (culex fatigans, and some others).—Carry dengue or break-bone fever. In 1895, 50,000 out of a population of 65,000 had the disease in Charleston, South Carolina; pain excruciating; no mortality in the otherwise strong. Parasite not certainly known.
Some evidence to show that it goes through a cycle in man and another in the mosquito.

Anopheles culex, panoplites, and other mosquitoes.—Carry filaria Bancrofti. (Manson, China, 1876.) Thirty to 40 per cent. of the South Sea Islanders have filaria in their blood; 10 to 50 per cent. in China. This disease, as a rule, causes no symptoms; occurs in tropical and sub-tropical countries; adult worm lives in human tissue (the lymphatics), a thread from three to four inches long. The embryos or larvae swim free in the blood and are thus sucked up by the mosquito. The embryo or larva undergoes a cycle of changes in the tissues of the mosquito lasting fourteen days or longer, depending on the temperature.

Stegomyia calopis.—(Reed, Carroll, Agramonte and Lazear, Cuba, in 1910.) Carries the leptospira icteroides, the cause of yellow fever. The United States has lost more lives in the past from this disease than any other country. In 1878 an epidemic affected 132 towns in our Southern States with 15,000 deaths and a loss of over $100,000,000. Texas, 1903, over 1,000 cases. New Orleans, 1905, over 8,000 cases; 900 deaths. Since 1793 the United States has lost over 100,000 lives through yellow fever. Has been a serious disease in army camps. Probably a cycle in man. A cycle of some sort in the mosquito.

Anopheles mosquito.—Ross proved mosquito to be carrier of malarial parasite in 1897. About 1,500,000 cases a year in the United States with 12,000 deaths, estimated by L. O. Howard in 1912. Ross estimated 1,130,000 fatal cases annually in India. Another very important disease in military camps. A cycle of development in man, and a cycle in the mosquito.

Certain Fleas: The rat flea, lemopsylla cheopis.—Carries the bacillus of bubonic plague. Sixth century, one-half of the people of the Roman Empire died from the plague. Fourteenth century, 25,000,000 people died of this disease in Europe; was called "The Black Death." Seventeenth century, 70,000 died in London alone. Oriental pandemic, 1895-1910, and on; 7,500,000 deaths in India during a period of fifteen years. (Martin, British Medical Journal, November, 1911.) A disease of historical importance in military campaigns. One of the serious concerns of the camp and naval sanitarian. Bacillus pestis, transferred from rat to rat and from rat to man by the rat flea which feeds on rats and on human beings. Not necessarily an active carrier.

Insects that May Be Passive Carriers of Disease

Cockroaches.—Have been known to carry the bacillus of typhoid fever. The intestinal parasites of certain cockroaches are known to cause malignant growth in rats when eaten by them.
Water-bugs.—Nothing proven, but their habits are bad and their opportunities are sufficient.

House Ants.—In a class with cockroaches.

Lice.—Known to have carried typhus fever. (Body lice; head lice, probably.) Death-rate, 40 to 50 per cent. Known to have carried relapsing fever. Death-rate about 4 per cent. Carriers also of trench fever.

Bedbugs.—Known to have carried spirillum of relapsing fever and bacillus of bubonic plague. The bacillus of tuberculosis has been found in the intestinal canal of this insect.

The Gnat.—Carries the unknown cause of “Adriatic” or “Three-day fever.” Death rare.

Fleas.—Chiefly notorious as active carriers. (See above.)

Mosquitoes.—Chiefly notorious as active carriers. Have been found with living tubercle bacilli in their intestines; also bacillus of leprosy.

The House-fly.—In July a single fly has been found to carry on his body as few as 570 and as many as 4,400,000 bacteria; and in his body (intestines) as few as 16,000 and as many as 28,000,000 bacteria.

The following common pathogenic bacteria have been found on the house-fly or in his intestines or in his feces: Bacillus of typhoid fever; spirillum of cholera; bacillus of bubonic plague; the cause of summer diarrhea; bacillus of tuberculosis.

The importance of the filthy habits of the house-fly in the home, the community and specially in camp and trench life. One of the lessons learned through our disgraceful experience in the Spanish-American War taught us that the fly as a carrier of typhoid fever may be more dangerous to a dirty, careless camp than a human fighting enemy.
from which the anophiles mosquito secures the pathogens of malaria in the spring. The human serves as a reservoir through the preceding winter. If all such cases were treated with anti-malarial measures there would be no reappearance of malaria from such a source. People sick with malaria, yellow fever, and other diseases carried by insects should be kept away from such insects. If the insect—mosquito, biting fly, flea, louse, etc.—has no opportunity to find a human carrier, it will not become a carrier unless there is some other animal that serves as a reservoir from which the insect may secure the pathogen. England has no malaria now (1918), but England has many anopheles mosquitoes that would carry malaria if there were any humans with the disease in England. Unless extraordinary care is taken, soldiers returning from malarial countries will reintroduce the malarial parasite into England after the Great War.

Keep animal carriers away from insects that might secure pathogens from them. It is important to destroy infected rats, ground squirrels, and other animals from which the flea secures the bacillus of bubonic plague. The jungle animals of Africa are sources from which the tsetse fly secures the trypanosome of sleeping sickness. If all such infected animals were destroyed, there would be no more sleeping sickness.

Destroy the insects that may become carriers. Kill the adult insects. Use fly-traps and fly poisons. Note the bat towers of the South for the destruction of mosquitoes. Delousing equipment for army service.

Destroy the breeding-places of insects. Dispose of human and animal excretions so they may not serve as breeding-places for insects. Important consideration in building cesspools, privies, latrines, sewers, barns, cow-yards, pig-pens, etc. Dispose of garbage, carcasses of animals and decaying organic matter in which flies may breed. Drain swamp land, dry up pools and other standing water so mosquitoes will not breed there.

Use screens on windows and doors. “A yard of screen on the window is better than a yard of crepe on the door.”
ANIMALS AS CARRIERS OF PATHOGENIC ORGANISMS

A.—General Considerations

The animals that are known to have carried disease to man are: The dog, the cat, the cow, the horse, the sheep, the hog, the goat, the rat, certain fish.

We must admit the possibility of there being other animal carriers whose relation to disease is yet unknown.

The organisms which animals may carry: Pathogenic bacteria, pathogenic protozoa, filtrate viruses, higher animal parasites.

The sources from which animal carriers may secure the pathogenic organisms which they carry:

(a) Other animals and human beings. (1) By contact. (2) From bites of animals. (3) From excretions. Through direct contact and through contamination of food, water, droplets of saliva in the air (from sneezing, coughing, etc.), dust, articles with which the animal comes in contact. (4) Carniverous animals may become diseased through the diseased flesh which they may eat.

(b) From insect carriers of disease. Remember that these insects in turn have secured their burdens of pathogenic organisms from other animals or men. They may be passive carriers. They may be active carriers.

Ways in which animals may carry pathogenic organisms: (a) As passive carriers; pathogenic organisms may be merely mechanically adherent to the surface of the skin or in the hair, or these organisms may be present in the alimentary tract, living on its surface or in the food therein contained. (b) As active carriers. (1) The animal may be sick with some specific disease. It may be a carrier during the active phase of the disease. It may be a carrier while recovering. It may be a carrier for a long while after recovery. (2) It may have organisms of disease living in its tissues or on its external or internal surfaces with no evidence of resulting disease.

Ways in which animals may distribute the pathogenic organisms which they carry: (a) Through contact. Bodily contact with hair, skin, or other parts of the animal which carries disease organisms, or through biting. (b) Through excretions. These excretions may be released by way of the respiratory tract, the digestive tract, the genito-urinary tract, or open sores or infected wounds of the skin, eyes or ears. These excretions may infect such secondary carriers as droplets
in the air, dust, food and water of men and animals, articles in common use.

(c) By way of blood-sucking insects.

(d) By way of their dead bodies. (1) Insect carriers from such sources. (2) Animal carriers from such sources. (3) Commercial carriers of animal foods. Food animals may be diseased and their diseased food products put on the market. Diseased meats. The United States Department of Agriculture, through its Bureau of Animal Industry, between 1906 and 1912, condemned over 90,000 diseased carcasses and over 4,250,000 parts of carcasses. Diseased milk and milk products.

(e) Ptomaines.

XIV

ANIMALS AS CARRIERS OF PATHOGENS—Continued

B.—Specific Considerations

i. Specific Carriers.—(a) The dog may carry skin diseases, respiratory diseases, intestinal diseases, hydrophobia, diphtheria (puppies). One importance of the dog as a source of injury and as a carrier of disease is shown in the weekly bulletin of the Department of Health for New York City, February 27, 1918, which reads in part as follows:

NUMBER OF DOG BITES REPORTED AND THE CHARACTER OF THE CONTROL OF THE ANIMALS

<table>
<thead>
<tr>
<th></th>
<th>1915</th>
<th>1916</th>
<th>Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total dog bites reported</td>
<td>3,650</td>
<td>3,247</td>
<td>403</td>
</tr>
<tr>
<td>Dogs biting while leashed</td>
<td>404</td>
<td>358</td>
<td>82</td>
</tr>
<tr>
<td>Dogs biting while muzzled*</td>
<td>404</td>
<td>263</td>
<td>141</td>
</tr>
<tr>
<td>Dogs biting while leashed and muzzled...</td>
<td>263</td>
<td>120</td>
<td>143</td>
</tr>
<tr>
<td>Not leashed or muzzled...</td>
<td>2,334</td>
<td>2,333</td>
<td>1</td>
</tr>
<tr>
<td>Condition of control not known...</td>
<td>209</td>
<td>163</td>
<td>46</td>
</tr>
<tr>
<td>Dogs biting (animals licensed)...</td>
<td>...</td>
<td>1,254</td>
<td>...</td>
</tr>
<tr>
<td>Dogs biting (animals ownerless)...</td>
<td>...</td>
<td>247</td>
<td>...</td>
</tr>
<tr>
<td>Vicious dogs destroyed (Sec. 10 S. C.)...</td>
<td>...</td>
<td>796</td>
<td>...</td>
</tr>
<tr>
<td>Rabid dogs (Laboratory confirmation)...</td>
<td>113</td>
<td>24</td>
<td>89</td>
</tr>
</tbody>
</table>

* Many dogs are only apparently muzzled. Recently the courts have decided that an animal which can still bite is not muzzled within the meaning of the law.
NUMBER OF DOG BITES REPORTED AND THE OCCURRENCES OF HUMAN AND ANIMAL RABIES—1907 TO 1918 INCLUSIVE

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Bites</th>
<th>Rabies (Human)</th>
<th>Rabies (Animals, Dogs)</th>
<th>Deaths from Rabies (Human)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1907</td>
<td>1,104</td>
<td>28</td>
<td>37</td>
<td>28</td>
</tr>
<tr>
<td>1908</td>
<td>4,622</td>
<td>16</td>
<td>104</td>
<td>16</td>
</tr>
<tr>
<td>1909</td>
<td>5,168</td>
<td>7</td>
<td>57</td>
<td>7</td>
</tr>
<tr>
<td>1910</td>
<td>3,792</td>
<td>7</td>
<td>75</td>
<td>7</td>
</tr>
<tr>
<td>1911</td>
<td>4,192</td>
<td>11</td>
<td>212</td>
<td>11</td>
</tr>
<tr>
<td>1912</td>
<td>4,366</td>
<td>8</td>
<td>239</td>
<td>8</td>
</tr>
<tr>
<td>1913</td>
<td>4,462</td>
<td>8</td>
<td>318</td>
<td>8</td>
</tr>
<tr>
<td>1914</td>
<td>3,640</td>
<td>1</td>
<td>113</td>
<td>1</td>
</tr>
<tr>
<td>1915</td>
<td>3,247</td>
<td>1</td>
<td>34</td>
<td>1</td>
</tr>
<tr>
<td>1916</td>
<td>2,873</td>
<td>0</td>
<td>31</td>
<td>0</td>
</tr>
<tr>
<td>1917</td>
<td>2,807</td>
<td>0</td>
<td>19</td>
<td>0</td>
</tr>
</tbody>
</table>

(b) The Cat.—(1) As an active carrier (diphtheria). (2) As a passive carrier. The habits of the cat in the city and on the farm give that animal many opportunities to secure infectious material and to distribute it.

(c) The Cow.—Beef may contain (1) bladder-worms that develop into tape-worms (tinea); (2) various other diseases of cattle, foot-and-mouth disease, bovine tuberculosis. The bacteria of decomposition and their toxic products may be communicated to man through “spoiled” beef. Milk may contain organisms of diseases that exist in the cow (mastitis, bovine tuberculosis, etc.). Milk may be contaminated by the excretions from the cow, other animals, or human beings. The clean milk supplied by the Straus depots during recent summers in New York City reduced infant mortality from milk-borne diseases.

(d) The Horse.—Certain diseases of the horse are transmissible to man. Flesh eaten in some countries.

(e) The Sheep.—(Anthrax).

(f) The Goat.—(Malta fever).

(g) Certain Fish.—(Bladder-worm or tapeworm).

(h) Oysters.—(Typhoid, ptomaines).

(i) The Hog.—(Trichinae, bladder-worms).

(j) The Rat.—Bubonic plague and the flea, dwarf tapeworm, other possibilities.

2. Defenses Against Such Carriers.—(a) Prevent the infection of animals. Improve their sanitary and hygienic surroundings. Keep human and animal excretions from reaching them. Keep carriers of disease from them, such as rabid animals, biting insects, and human carriers.

(b) Prevent the infection of humans by animals. (1) Destroy diseased animals or effectively isolate them until cured. Destroy rats. (2) Keep animal carriers away from humans. Danger from pets. (3) Keep animal excretions away from human food, drink, and articles in common use. (4) Inspect and condemn all diseased animal foods or animal products. Federal Meat Inspection, United States Department of
Agriculture, Bureau of Animal Industry, data for the six years, ending September 23, 1912: Animals inspected at slaughter, over 321,000,000; carcasses condemned, over 90,000; parts of carcasses condemned, over 4,250,000; reinspection of meat and meat food products in their various preparations, over 37,000,000,000 pounds; condemned on reinspection, over 140,000,000 pounds; exported under certificate, 7,000,000 pounds. (5) Institute rigid sanitary measures in establishments producing animal foods—dairies, packing-houses, meat markets, stockyards. (6) Institute and enforce intra-state inspection.

XV

THE DISSEMINATION OF PATHOGENS THROUGH CONTACT

A. The most common and the most important contact diseases are the venereal diseases. These diseases may be carried indirectly by secondary carriers, but their most common conveyance is by direct intimate contact between the human carrier and his victim. This intimate contact is secured under various circumstances, such as:

(1) Between husband and wife.—The numerous natural honorable and sacred intimacies that characterize the normal relationship between husband and wife make it most difficult for either one to acquire venereal disease without transferring such disease to the other.

(2) Between parent and child.—(a) The contact between the father and his children is not so intimate as the contact between the mother and her children. If, however, the father has venereal disease, the mother can hardly escape, so the children will be exposed to maternal infection as well. (b) The infant of a gonorrheal or syphilitic mother becomes infected either before birth or at birth. (c) If the mother becomes infected after the birth of her children she may transmit her disease to her children through such intimacies as nursing, feeding, kissing, bathing, or fondling them. Remember, such infection, if it is with the treponema of syphilis, frequently means death to the unborn babe or some physical or mental disability disqualifying and limiting it for life; if it is with the coccus of gonorrhea, it often means a blind baby—a life without eyes.

(3) Between members of the same family in which one member has been infected.—The opportunity indicated above as existing between parents and children exists also between sons and daughters, young and old. The opportunities for such intimate contact in the home are commonly present and hard to avoid, even when such avoidance be-
comes seriously necessary. It is, therefore, commonly true that syphilis and gonorrhea are transferred by contact from one infected member of the family to some or all of the remaining members of the family. This transfer of infection is inevitable between husband and wife after one of the two becomes infected and most difficult to avoid between infected parent and child, or between an infected brother or sister and the other children in the family.

(4) Between the physician, the nurse and the infected patient.—Many cases are on record in which the physician or nurse has become infected while operating upon or caring for a syphilitic or a gonorrheal patient.

(5) Between the carrier of venereal disease and his victim under any condition of intimate contact, as in (a) Handling, fondling, kissing, etc. (b) The most common and most important contact in this connection is that which occurs in illegitimate sexual intercourse. Every loose man and every loose woman sooner or later becomes a carrier of one or all of the venereal diseases. (Remember, syphilis is caused by the treponema pallidum; gonorrhea is caused by the gonococcus; and chancroid is caused by a specific bacillus.) Loose moral characters of this sort are found in all parts of the world, in every community. It is not possible to estimate accurately the number of human carriers of syphilis and gonorrhea in New York City. Probably five percent of the population has syphilis, and a very much larger percent gonorrhea.

The venereal diseases are the most common diseases of mankind excepting possibly tuberculosis. These diseases are mentally, morally and physically destructive. They are distributed by contact infection. The common and important carriers are the men and women who resort to illicit, promiscuous sexual intercourse. The man or woman that adopts such a practice must sooner or later suffer the effects of one or all of these diseases and will in all probability be responsible for conveying such disease to some other human being, who will thus become the victim—innocent or guilty—of his passion.
THE DISSEMINATION OF PATHOGENS THROUGH CONTACT—Continued

B. The pathogens that are excreted through the respiratory tract are distributed most frequently through contact infection. These pathogens cause such disease as measles, the common cold, diphtheria, tonsilitis, scarlet fever, mumps, meningitis, poliomyelitis, leprosy and whooping-cough. Others might be added. (2) The "contact" necessary for infection from such sources must be intimate. It must result in the passage of pathogenic organisms from the carrier to the "victim." This may be accomplished through fondling, kissing, biting, or scratching; from passing a pipe from one mouth to another; through chewing gum, or biting the partially eaten apple of another person; through testing the baby's milk by sucking a sample through the nipple of the baby's bottle; through chewing the baby's food before giving it to the baby; through a bite from another man's plug of tobacco; through drinking from another's cup; through breathing air into which some one has just sneezed, coughed, or otherwise sprayed his infected respiratory excretions. Opportunities for such infections are specially present in congested subway travel, movie shows, and in the life of the average infant and young child. (Droplet infection.)

C. More rare are those contact infections in which the individual picks up specific organisms of disease through handling persons who are carriers of disease (sick or well). (1) Doctors and nurses not infrequently become infected in this manner. Such infections are not confined to any group or class of human disease carriers. The physician or nurse may (and often do) become infected through contact with blood or tissue juices during surgical operations. They may come into intimate contact through the administration of medicine; bathing the patient; dressing a wound; or any other of the very necessary and very important offices which they perform. Contact infection under such circumstances is due to carelessness or accident. The intelligent physician and nurse know these dangers and how to avoid them. (2) The same variety of opportunities for contact infection occurs in homes in which some member of the family is sick, especially if the family habits of personal and domestic hygiene are not good.

D. Contact infection may occur in large crowds where people are brought close together, as in congested subway trains, on the ferry-
boat, in the street-car, on the elevated train, at the theatre, at the moving-picture show, in the class-room, and so on. Under such circumstances droplet infection is probably the most common variety of contact infection.

E. The diseases of the intestinal tract are usually not transferred by direct contact, although such conveyance does take place. The soiled fingers of the carrier may come into intimate contact with his victim and thus distribute to him the bacillus of typhoid fever or some other cause of intestinal disease. It is said that 4 per cent. of all typhoid fever cases that recover become chronic carriers. The majority of these are fecal carriers. The fingers of typhoid carriers or the carrier of any other disease organism are always dangerous and call for most careful hygiene. We have records of a number of men and women who have distributed typhoid fever in this manner for many years—as high as fifty-five years—after they have had that disease.

F. Summary.—Contact infection is the common mode of conveyance of the causes of venereal and respiratory diseases. It is less commonly the mode of conveyance of other diseases. Such conveyance may occur during the acute stages of these diseases, and under conditions of apparent health of the individual long after such diseases are "cured." These diseases may be avoided for the most part by such habits of personal, domestic and community hygiene as will eliminate or prevent contact infection. The individual and the community may be defended from contact infection by having no infected contacts. Personal cleanliness is a very important protective measure in relation to contact infection.

XVII

DISSEMINATION OF PATHOGENIC ORGANISMS THROUGH SECONDARY CARRIERS

Air as a Carrier of Disease

(a) Disease germs may be blown through the air by the wind. (1) The various human and animal excretions that are exposed to air may contain pathogenic organisms. These organisms may remain alive for hours or days or weeks, depending upon their protection from drying. If air currents set particles of these excretions in motion before the pathogens are dead these currents may serve as carriers of disease. Flakes of sputum, dejecta, urine-soaked dust, and discharges from the
sick-room may qualify for such possibilities. Fortunately such possibilities are opposed by the influence of sunlight, sun-heat and dry air, all of which destroy the lives of most pathogens, after a time. (2) certain experiments indicate that organisms of very small size may not be subject to the ordinary laws of gravity but rather to the laws that govern gases in space. If this is true, the aerial transmission of disease germs of very small size may be much like the transmission of odors of gases in the air. (a) There are a number of diseases whose specific causes are so small as to be able to pass through the pores of the finest porcelain filters. They are so small that they are beyond the range of our most powerful microscopes. These “filtrate viruses” or “ultramicroscopic viruses” may be small enough to escape the laws of gravity which attract heavier bodies. They may obey the laws that govern gases in space. (b) There are a number of human diseases the causes of which are not known. These causes may be filterable. We have no means of testing the filtrates of some of these diseases. It is possible that the specific causes of those diseases may be small enough to fall into this class. (c) It is certain that aerial transmission of the sort that characterizes the movements of gases in space is not characteristic of such diseases as typhoid fever, tuberculosis, and diphtheria. The organisms that cause those diseases are relatively heavy. (d) We cannot be certain that the causes of smallpox, infantile paralysis and scarlet fever may not be spread in this manner under exceptional and favorable circumstances.

_Dust as a Carrier of Disease_

Dust may be a carrier of disease only in case pathogens in dust are carried to human beings while they are still alive. Sunlight, sun-heat, dry air and other adversities kill most pathogens in minutes, hours or days. The spores of bacteria are very much more resistant than bacteria themselves. Tubercle bacilli in sputum are protected by the viscid mucous around them. Drying may then be slow. Diphtheria bacilli in membranes from the throat may remain alive for some weeks. Pathogenic organisms in fecal masses will remain alive for short periods of time. Pathogens from any source that are excreted in dark, damp, and dirty places may become parts of dust which are not thoroughly dry. They may thus escape death for short periods. The bacillus of tuberculosis, the bacillus of typhoid fever, the bacillus of diphtheria, and the streptococci of sore throat have been found in dust. Spores of various pathogenic bacteria are found in dust. Dust may be carried by the wind to human beings, to their food, or their drink. Dirty hands
and dirty utensils in common use may be infected under unusual circumstances. May explain the fact that children are more likely to have various diseases than adults.

XVIII

DISSEMINATION OF PATHOGENS THROUGH SECONDARY CARRIERS—Continued

Water as a Carrier of Disease

(a) Families that secure their water from wells are safe from water-borne diseases from that source, provided the drainage into the well is pure. It sometimes happens that the yard privy, the cesspool, or the barnyard drains into the family well. (b) It not uncommonly happens that communities construct water systems that draw the water supply from the same lake or river into which their community sewage is emptied. Under such circumstances typhoid fever is common. Various other diseases, notably cholera, are carried in the same way. Every community that has spent its money wisely in securing pure water has succeeded in reducing the amount of preventable sickness and the number of avoidable deaths among its citizens. This reduction is not only in typhoid fever, but in various other diseases. (c) Importance of pure water in active army life. (d) Fortunately, most of the pathogenic organisms are soon destroyed in water; unfortunately, nearly all pathogens will live for short periods in water. These short periods may be long enough to enable water-borne pathogens to find human victims.

Food as a Carrier of Disease

(a) Sources of disease organisms and agents in foods. The food itself may be diseased and thus act as a carrier of that disease to its human consumer. Tapeworms may come from eating raw or insufficiently cooked beef, pork, or fish infected with the cysterci of tapeworms. Cattle may have tuberculosis, anthrax, or other disease. Food may be infected while in the hands of the producer, the shipper, the transportation agent, the wholesaler, the retailer, or the consumer. Food may be adulterated by the manufacturer or dealer who uses poisonous preservatives or other injurious adulterants. Food may decompose and thus contain toxic products of bacterial action.

(b) Decomposed foods. The fermentation of carbohydrate foods
leads to the formation of acids, alcohol, carbon dioxide, water, etc. These end products are not so poisonous as some of the intermediate products of putrefaction. The putrefaction of nitrogenous foods, when complete, leads to the formation of simple non-poisonous compounds such as ammonia, nitrates, carbon dioxide, water, etc. The intermediate cleavage products of putrefaction are poisonous. Some of them are very poisonous. There are many kinds of fermentation and many kinds of putrefaction. "Each particular micro-organism breaks down organic matter in a specific and limited sense." (Rosenau.) Ptomaine poisoning. "Ptomaines are secondary cleavage products of protein putrefaction." The poisonous stages of decomposition of such foods as milk, cheese, and meat occur when putrefaction has not been completed. Cheese is most poisonous—if poisonous at all—when it is "green." (Rosenau.) "Meat, if toxic, is most poisonous from the fourth to the eleventh day of putrefaction." Other foods follow the same rule. The important ptomaines are sepsin, cadaverin and putrescin. "... Most, if not all, cases of so-called ptomaine poisoning are nothing more nor less than acute infections with B. paratyphosus, B. enteritidis, B. cholera suis and other micro-organisms belonging to this group." (Rosenau.)

XIX

DISSEMINATION OF PATHOGENS THROUGH SECONDARY CARRIERS—Continued

_Milk as a Carrier of Disease_

"Milk is responsible for more sickness and deaths than perhaps all other foods combined, because bacteria grow well in milk; therefore, a very slight infection may produce widespread and serious results. Of all our foodstuffs, milk is the most difficult to obtain, handle, transport and deliver in a clean, fresh and satisfactory condition. It is the most readily decomposable of all our foods. Milk is the only standard article of diet obtained from animal sources consumed in its raw state." (Rosenau.)

Dirty milk. The sediment in the bottom of the milk jar or in the bottom of your glass of milk is practically always cow manure.

The organisms of certain bovine diseases will pass through the healthy udder. This is true of the ultra-microscopic virus of foot-and-mouth-disease, the virus of malta fever, and the virus of milk sickness.

The organisms present in the diseased udder will likely be present in the milk. Bovine tuberculosis; mastitis.
Milk may be infected through contaminations introduced in handling, such as typhoid fever, scarlet fever, diphtheria, human tuberculosis.

"The diseases most commonly conveyed through milk are tuberculosis, typhoid fever, diphtheria, scarlet fever, septic sore throat, Malta fever, foot-and-mouth disease, and milk sickness; also some of the summer complaints of children and the diarrheal and dysenteric diseases of adults. . . ." (Rosenau.)

Raw milk is not safe milk. The safest milk is the milk that is pasteurized in the bottle.

XX

DISSEMINATION OF PATHOGENS THROUGH SECONDARY CARRIERS—Continued

Meat as a Carrier of Disease

(a) Ptomaine poisoning, poisoning from spoiled meats, ptomaine produced by the bacillus botulinus, ptomaine produced by the bacillus proteus vulgaris and the bacillus coli communis.

(b) Infections carried by meat, sources of these infections, disease of the animal, infection of the meat after slaughter of the animal, varieties of infections carried. (1) Various forms of "meat poisoning." With bacillus enteritidis and bacillus cholera suis. (2) Paratyphoid fever. The paratyphoid bacillus multiplies in meat. (3) Trichinosis. Caused by a round worm that lives its life cycle in the hog or rat. Is communicated to man in raw and insufficiently cooked pork. (4) The pork or measly tapeworm (tænia solium). Conveyed to man by eating raw or insufficiently cooked pork containing the bladder-worms (cysterci) of the pork tapeworm. The cysterci develop in hogs whose food has been contaminated by human feces containing the eggs of the pork tapeworm. These cysterci may develop also in man if his food contains the eggs of the pork tapeworm. This is a very serious disease. (5) The beef tapeworm (tænia saginata). Conveyed to man by eating raw or insufficiently cooked beef containing the bladder-worm (cysterus) of the beef tapeworm.

Fish as a Carrier of Disease

Some fish are always poisonous. Some fish are poisonous only during spawning season. Fish decompose rapidly. Ptomaine poisoning is relatively common from this source. Fish are common victims of bacterial disease. Human poisoning from this source is not uncommon. Fish tapeworm (Dibothriocephalus latus). Human beings become in-
fected with fish tapeworm by eating fish containing the bladder-worms (cysterci) of fish tapeworms. Same thing occurs in dogs, cats, and foxes that eat infected fish. Fish become infected in streams polluted by human excretions containing the eggs of fish tapeworms.

Shellfish as Carriers of Disease

Ptomaines appear as secondary cleavage products of decomposition. Poisoning from shellfish is not uncommon. Typhoid fever and cholera have been carried by oysters.

Plant Foods as Carriers of Disease

Mushroom poisoning. Some species of mushrooms are edible; others are poisonous. Potato poisoning. Potatoes contain small amounts of solanin. Very rarely this poison is present in sufficient amount to cause trouble. Rice, when eaten without the bran or pericarp, may cause beri-beri, a common disease in Japan and other tropical and sub-tropical countries. A disease due to a deficiency of vitamin. Over-milled corn seems to be the cause, or a cause, of pellagra, a common and serious disease in Europe and America. Due to vitamin deficiency. Green foods, such as lettuce, radishes, celery, watercress, when eaten raw, may carry typhoid fever, cholera, dysentery, hookworm, and various other animal and vegetable parasites which have been brought to those vegetable foods in sewage or in water contaminated with sewage.

It is evident that the greater and more important part of the diseases carried by air, dust, water, or food, comes originally from human sources. These various agents are infected usually through human excretions. Our problem of self-protection here is concerned with keeping human excretions from such carriers.

SUMMARY

The human being is the most important carrier of disease. He distributes pathogens by way of his excretions—respiratory, fecal and genito-urinary—in health and in disease. His circulation may be a "reservoir" of pathogens for blood-sucking insects while he is sick or when he is apparently well.

He may transmit the organisms of disease by direct contact or through the infection of animals or insects or through the infection of articles of common use. The most important relationships are secured through "droplet infection" and spitting; illicit sexual intercourse, dirty fingers, and careless disposal of excretions.
The most important insect carriers are the fly, mosquito, flea and louse.

The most important animal carriers are the cow (by way of her milk), the rat, the dog.

The most important food carriers are milk and infected (and decomposing) meats.

Unclean, impure water is a common and dangerous carrier the world over.

The disease carrier is a serious menace in all types of communities—civic, military or institutional. Community health must be protected against persons that are sick; careless humans that “hawk” and cough and spit without regard for others; men of loose morals; prostitutes; post-febrile carriers (particularly after typhoid fever); people that practice bad hygiene; impure milk, bad water, the fly, the mosquito, the flea, the louse, the rat, the dog.

Cleanliness is the first law of health.
PRESSBOARD
PAMPHLET BINDER

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GAYLORD BROS. Inc
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Stockton, Calif.