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AN INVESTIGATION INTO THE ETIOLOGY OF PHTHISIS.

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V.

Tubercular Peritonitis.

By Heneage Gibbes, M.D.,

There are some interesting points in this disease which deserve a short notice. In all the cases I have examined of tubercles in the omentum and mesentery the lesion consisted of an aggregation of small, round cells, generally surrounding a bloodvessel. Some of these nodules have a gray translucent appearance to the naked eye, and I have never been able to find any tubercle bacilli in them. Some, however, have a whitish opaque appearance, caused by the disintegration of their central portions; in these I have invariably found tubercle bacilli.

I have made a number of experiments on animals by feeding and inoculation to see whether I could produce these conditions artificially, but I have found I could not rely on so doing by any one method, although I have produced them often. I have found the appearances presented were of two kinds:

1st. An immense number of small bodies, about the size of a millet-seed, studded the omentum and mesentery; they were translucent, and on making sections of them and staining with logwood they were found to be collections of small round cells with a patent bloodvessel running through them.

2d. Numbers of rather larger bodies having a white opaque look and on section showing a number of similar small round cells at the periphery while the centre consisted of a granular débris resembling caseation.

In the first kind I have never been able to find any tubercle bacilli; in the second they are almost always present, and generally in such numbers as to give a distinctly red appearance to the centre of the nodule. I have not been able to find any recorded account of reticular tubercles in this situation. In connection with this so-called tubercular peritonitis

it is interesting to note the cases where laparotomy has been performed and has resulted in curing this condition. In several cases the abdomen has been opened under the impression that it contained an ovarian tumor. In one case, recorded by Sir Spencer Wells, the patient was alive and well twenty-two years afterward. Knaggs and Clarke, of Huddersfield, have recorded similar cases, also Lawson Tait. These cases have, however, been open to the objection that it has never been proved they were actually tuberculosis—that is, the presence of tubercle bacilli had not been demonstrated. At the request of Dr. Bowditch the records of a case have been sent me by Dr. Henry O. Marcy, which remove this objection. The case is as follows:

November, 1886, a woman, æt. thirty, had been under observation in the hospital for some months, suffering from severe pain and emaciation, with uterus fixed. This was considered to be a case of old tubal disease. Dr. Marcy performed laparotomy and found disseminated tubercles in the mesentery and abdominal walls. A small portion was removed for examination. The abdominal cavity was washed out with a solution of bichloride of mercury 1 : 2000 and closed up. Examination showed the miliary tubercles in the portion removed to consist of colonies of tubercle bacilli, and this was confirmed by subsequent cultivation. Recovery followed with an improvement of all symptoms. In the following spring the patient sailed for Europe and in a letter dated August, 1887, she writes: "Am enjoying at present very good health, being able to work again."

This is, as far as I am aware, the only case where an examination has been made for the tubercle bacilli. Since the above was written I have received a very interesting paper, by Dr. William Osler, on "Tubercular Peritonitis," in which is an account of a case where reticular tubercles were found by Dr. Councilman containing numerous tubercle bacilli and no caseation in the nodules. It however, agrees exactly with what I have found several times in artificial tuberculosis in animals where the mesentery and omentum have been affected. I have no doubt other cases will be recorded showing similar facts; in the meantime we have the evidence of one case that numerous nodules containing tubercle bacilli can exist in a serous membrane without setting up a condition of general tuberculosis. The cure of these cases by abdominal section in the present state of our knowledge seems very difficult to explain. Such a weak solution of mercury could hardly have any action on bacilli shut up in these nodules.

Bovine Tuberculosis.

By some authorities this disease is held to be identical with human tuberculosis—that is, by those who hold the view that tuberculosis is only such when the tubercle bacillus is present. Others consider the disease to be different in many respects, and extended observation obliges

me to agree with their conclusions. In the first place, the ordinary chronic tuberculosis of cattle has nothing whatever in common with pulmonary phthisis in the human subject, except the presence of a bacillus which has the same chemical reaction to staining agents as the tubercle bacillus of Koch. It has, however, many features similar to those in chronic tuberculosis in man, and also many marked differences.

On examining the lungs of a cow affected with tuberculosis the appearances presented under the microscope are those of reticular tubercle containing a large number of giant cells and also a number of large, so-called epithelioid cells; this reticular tissue is arranged round the margins of large caseous masses, which, in the majority of cases, has undergone calcification to a large extent. So far the disease resembles that found in the human lung, with the exception of the calcification, which, almost universally present in the bovine animal, is rare in the human. Another point, also, is the frequency with which large nodular masses are found in the pleura of cattle affected with this disease, which on examination are found to be composed of reticular tubercles. All these reticular tubercular formations consist of aggregations of small tubercles which appear to have grown and degenerated in a similar manner to that already described as occurring in the human subject.

So far the difference between the human and bovine disease is slight, and it is not until we treat sections of these lungs in a special manner to show the bacilli contained in them, that the difference becomes more marked. It is then seen that the bacillus itself differs in size from that found in human tuberculosis; it is much smaller. Klein (*Microörganisms and Disease*, 3d ed.) says they are nearly half, or at least one-third smaller. This may not seem an important point to many until they consider the extremely minute variations in shape and size which have been held, by some, to constitute a different species of microörganism and establish its connection with some form of disease.

The next point of difference is in the distribution of the bacilli, and here it is very marked. The bacilli are found principally in the giant cells and so-called epithelioid cells, and their arrangement in the giant cells is peculiar; they are arranged circularly round the periphery of each cell. The so-called epithelioid cells are packed full of them, and they can be found in clumps where these cells have broken down. I have before pointed out that bacilli are not found in the giant cells of tuberculosis in the human lung; at least, such is my experience and it is supported by other observers. We then have a difference in the bacillus itself morphologically and also in its distribution and relation to the component parts of the tubercular growth, from that of the bacillus found in the human lung, their only point of resemblance being their reaction to certain staining agents.

The next point to be considered is, Do they affect animals in a similar manner to those taken from human lungs when inoculated?

To settle this point I have made a large number of experiments both in feeding and inoculating animals with tubercular material obtained directly from the lungs of animals affected with tuberculosis.

The results I have obtained were the following. I will not give the experiments in detail, as they have been so numerous it would prove tedious.

The effect of the inoculation of guinea-pigs with bovine tubercular matter is to produce in them a general tuberculosis in which all organs are more or less affected. There are two points, however, worthy of notice.

I find throughout my P. M. notes of these cases, constantly occurring in the description of the microscopical appearances in the lungs and liver, the following remark: "The tubercular process seems to have commenced in the interlobular tissue and extended from it into the organ." Now this is exactly what I have found in many animals where this form of tuberculosis has occurred spontaneously, and it may have some significance. The second point is the freedom of the kidney from infection, and this applies to inoculation of human matter as well as bovine. I have never found the kidney affected except in those cases where pregnancy has allowed the disease to exist for a long time, months instead of weeks.

It must be understood that I am now speaking of the results of inoculation on guinea-pigs only.

In monkeys I have never seen the kidney affected from inoculation with human tubercular material from any source.

In inoculation experiments on rabbits with bovine tubercular material the results were very different. In every case a marked general tuberculosis was produced with large masses of caseation containing numerous bacilli. An important point in connection with these animals is this: in every case inoculated with bovine tubercular material the kidney shared the fate of the other organs and presented to the naked eye a surface studded with tubercular projections, which on examination proved to be caseous and full of bacilli.

There is still another point of difference between human and bovine tuberculosis which may have some significance in the further line of investigation we are carrying on, which will be the subject of future reports.

I have mentioned before the fact that after eighteen years in spirit the tubercle bacilli in the human lung still retain their characteristic reaction. In the cow's lung, hardened in the same manner, I have found that four or five years in spirit entirely removes this property and I

cannot get any reaction from the bacilli. This, at any rate, is the case in several different specimens under observation.

I think from the foregoing facts it will be granted that the morphological difference in the bacilli and the marked difference shown by rabbits when inoculated with tubercular matter from these two diseases, justify us in considering that in the present state of our knowledge they cannot be classed as the same, the only identical point being the reaction of the bacillus to staining agents.

Klein, in his work on *Microörganisms and Disease*, third edition, 1886, says, page 170:

"According to my own experience, extending over a very large number of cases of human miliary tuberculosis and tuberculosis in cattle, I cannot for a moment accept the statement that the bacilli found in the two affections are identical; for I find that in the two diseases their morphological characters and distribution are very different. The bacilli of human tuberculosis are conspicuously larger than those of the tuberculosis of cattle, and in many instances more regularly granular. . . . . The bacilli in the tuberculous deposits of cattle are always contained in the cells; the larger the cell the more numerous the bacilli."

Different Animals in which Bacilli have been Found Giving the Reaction of Koch's Tubercle Bacillus.

I have examined a number of animals that died with diseases of the lungs and other organs and have found in them bacilli that give the characteristic reaction of the tubercle bacilli, although the lesions in many cases differ from those found in either human or bovine tuberculosis; and it may help in some degree toward the elucidation of the problem we are working at to give an account of these cases.

Monkeys.—It is a commonly received idea that the quadrumana are very subject to tuberculosis. This is not the case; the majority of these animals that die in confinement are the subjects of bronchitis, bronchopneumonia, acute pneumonia, pulmonary phthisis, or pleurisy. In 1883 in conjunction with Mr. J. B. Sutton, I examined the lungs of a number of monkeys that died at the Zoölogical Gardens, and out of this large number only five were considered tuberculous. At that time I made the diagnosis of tuberculosis more from the presence of tubercle bacilli than from the actual microscopical appearances; extended observation since has made me very doubtful if a *bona fide* case of reticular tubercle ever occurs in any of the quadrumana. I have had several of these animals that have died from general tuberculosis as it appeared to the naked eye, cases where tubercles existed in every organ, where the omentum and mesentery were filled by them and immensely thickened, but careful examination has shown that in every one of these cases there was no reticular formation, only caseous degeneration of inflammatory products, and in this degeneration were large numbers of bacilli giving the reaction of Koch's tubercle bacillus.

It is impossible to tell what these cases really are without a microscopical examination. I have lately examined the lungs of a monkey that had to the naked eye every appearance of tuberculosis. On hardening them, however, all these apparent tubercles had disappeared, and on making sections I found they were caused by a localized emphysema brought on by minute emboli. In a paper read by me at the Pathological Society of London, January 15, 1884, I described a similar case occurring in a Beatrix antelope.

Carnivora (*Viverridæ, Felidæ*).—Amongst the animals belonging to these groups examined were felis eyra, paradoxure, civet cat.

They had been fed on birds that were supposed to have died of tuberculosis. The changes found were in the liver, a portion of the organ had undergone caseation seemingly after some inflammatory condition; there was no appearance of reticular formation, and bacilli giving the tubercular reaction were found in the caseated portions.

Ursidæ (*Coatimondi, Bears*).—These are the only animals, other than ruminants, I have examined where there was any resemblance in the morbid process to that seen in bovine tuberculosis. In the lungs there were large masses of changed substance which consisted of a fibroid tissue with, in some cases, giant cells and numbers of the so-called epithelioid cells. These latter contained many tubercle bacilli. One bear had nodular growths in the pleuræ.

Camel.—I have examined the lungs of a camel supposed to be tuberculous. The case, however, was one of acute pneumonia the consolidation of which had not undergone resolution but had remained in patches throughout the lungs. The outline of the air-vesicles could be clearly made out in the consolidated portions. Tubercle bacilli were so numerous in these parts that they were easily visible with the naked eye as red patches, principally at the edges of the affected parts.

Birds.—I have examined a large number of birds that were considered to be the subjects of avian tuberculosis, amongst others the domestic fowl, turkey, grouse, golden pheasant, South American ostrich, emeu. The appearances presented by the organs of these varied exceedingly, and I shall have to separate the rhea or South American ostrich and the emeu from the others. The first specimen I received was the liver of a rhea sent me by Mr. J. B. Sutton. On making sections and staining them with logwood I found circumscribed areas surrounded by fibrous tissue containing a number of cells; these areas varied greatly in size and the larger ones had the centre filled with disintegrated cells. Outside these areas the liver structure was normal. On staining them for tubercle bacilli I found that these areas were made up of cells filled with bacilli giving the reaction of those found in phthisis. In the larger areas the cells had broken down and the bacilli were loose amongst the

débris. Between the affected parts a few cells could be seen containing the bacilli, but the majority were perfectly normal.

Dr. Klein made a drawing from one of my specimens of this liver for his work on *Microörganisms and Disease*, and considers it to be leprosy. This to anyone who has worked on leprous tissue is manifestly wrong. Since then I have examined the organs of two rhea and some emeu and have found in them the same appearances, but in these cases I was able to examine all the organs: the result showed that everywhere the relation of the bacillus to the tissue was the same; in the thyroid, the intestine, liver, etc., the various cells were full of bacilli in places, but they had exerted no influence on the surrounding cells, and only in exceptional cases had the irritation been sufficient to set up new fibrous formation round the affected cells. In the intestine, the appearance of the columnar epithelial cells crowded with these bacilli was very peculiar. In the grouse and pheasant (golden) the changes were very different; here the liver was the organ affected, and on staining sections with logwood here and there patches of large cells were seen: these patches were composed of cells that stained very differently both with logwood and methylene blue; those in the periphery took the stain well and showed one or more well-developed nuclei, while those toward and in the centre stained faintly or not at all.

For a long time I was puzzled to account for the origin of these cells, but after carefully examining a large number of sections from various cases, I was able to satisfy myself that they were simply liver cells that had become hypertrophied. On staining sections with special stains I found that those cells which had taken the logwood or blue stain well, contained no bacilli, while those that had stained faintly or not at all with logwood or blue, showed with the special stain several red bacilli, resembling the tubercle bacillus. That is, the normal cells contained no tubercle bacilli, only those that were undergoing degeneration. It was an interesting question as to where these seed-eating birds had obtained the infection and I made many careful investigations of their food and surroundings, the earth in their runs and the worms contained in the earth, to see if any bacilli were present, but I could find none in any way resembling the tubercle bacillus.

I have frequently found caseous masses in the liver of the domestic fowl which contained large numbers of bacilli staining similarly to the tubercle bacillus and resembling it somewhat in shape and size.

Snakes.—I have examined the livers of several large snakes, such as boas and python, which had died of disease presumably from having been fed on tuberculous birds.

The appearances presented were somewhat similar to those found in the rhea and emeu; that is, the liver cells in certain patches were full of bacilli giving the characteristic reaction, and some of the larger of these

patches were surrounded by a small amount of fibrous tissue evidently formed by the irritation set up. All the intermediary portions of the liver appeared to be normal. The majority of these cases I received from Mr. J. B. Sutton, whose numerous papers on comparative pathology published in the *Transactions of the Pathological Society of London* are very valuable. I have also obtained several cases from sources in this country and England, but the supply is much too small for extended work.

VI.

Conclusions Drawn from the First Portion of the Investigation.

By Drs. Gibbes and Shurly.

We wish now to point out the deductions we have made from our investigations so far, and later on we shall give the results of a number of experiments now in progress, but which will take a considerable time before we can get reliable data from them.

We consider that tuberculosis and phthisis pulmonalis cannot be classed as the same disease clinically, and in this opinion we are undoubtedly upheld by the majority of men having large clinical experience; we also consider that the appearances presented by the lesions in the lungs after death are so different in these two diseases, that they are even more widely separated pathologically than clinically.

It seems to us, then, that the position held by the bacillary theorists may be summed up in this way: To use an optical simile, rays coming from points as widely separated as tuberculosis, phthisis pulmonalis, lupus, bovine tuberculosis, scrofula, converge and come to a focus at a point, the bacillus tuberculosis. Here they immediately diverge, and when they have proceeded far enough—that is, to the post-mortem examination, they are found to be of different kinds, but each has its own identity. Our observations lead us to doubt whether all these rays do pass through the same focal point.

We would suggest the following classification of diseases of the lungs in which consolidation occurs:

Acute Miliary Tuberculosis.—Of two kinds, differing clinically only in the occurrence in one kind of typhoid symptoms, causing it often to be mistaken for enteric fever. Differing, however, *in toto* in the morbid histology, the one form being genuine tubercle, the other a collection of numerous small foci of inflammatory action.

Differing also in the distribution of Koch's tubercle bacilli, which in the latter form are always found in large numbers, but in the former are often absent and never numerous.

General Tuberculosis.—The clinical features varying according to the chronicity of the disease, but sufficient to a careful observer to distinguish it from phthisis pulmonalis, and never following broncho-pneumonia. Differing in its morbid histology, in that the consolidation is always formed by new growth, and not by inflammatory action, this new growth being characterized by its proneness to break down and disintegrate, thus forming cavities; enough of the new growth, however, always being left in the wall of the cavity to determine its tuberculous character.

Differing also from phthisis pulmonalis, in that many cases, even with large cavities, have been proved to be free from tubercle bacilli.

Phthisis Pulmonalis.—An inflammatory disease of the lungs, distinguished by rapid consolidation, which, however, may clear up if the process has not gone far enough to damage irretrievably the lung substance, and notable for the frequency with which it follows broncho-pneumonia. Differing from tuberculosis in that there is no formation whatever of new tissue; from beginning to end the process is one of inflammatory exudation, breaking down, or caseation, ending in the formation of cavities. Differing also from tuberculosis in the regularity with which tubercle bacilli are found in this disease, and their enormous numbers in the most acute forms.

Chronic or Fibroid Phthisis.—This from the beginning is a chronic change acting on the fibrous or interstitial tissue of the lungs. It may follow from many causes, such as the inhalation of irritating particles, or the presence in the lung of a consolidation, such as that of croupous pneumonia, which has not undergone resolution. Arising from such various causes, the clinical features will vary accordingly. The pathological change, however, is always the same, an increased growth of fibrous tissue which contracts, and in so doing damages the lung substance. Inflammatory action may, however, take place in a lung the subject of fibrous change which may be followed by caseation, and in this way the discrepancies in the accounts as to the relation of the tubercle bacillus to this disease may be accounted for.

The above classification is suggested, and will, we think, bear more minute investigation. It is, in fact, the classification of the older writers, which has been set aside by the discovery of Koch's tubercle bacillus, and we contend that this discovery is not sufficient, and cannot sustain the sweeping change that has recently been made in the views of many regarding these lung diseases. Koch himself laid down some axioms as necessary to be filfilled before a given microörganism could be accepted as the virus of a given disease. They are, as stated by Dr. Pye-Smith in the second edition of Fagge's *Practice of Medicine:*

1. The malady must have such distinct and constant features, whether *clinical or anatomical*, as shall enable it to be identified.

2. The microörganism must be itself distinguishable from all others by its size and shape, its staining properties, but above all by its mode of propagation in a pure cultivation (*i. e.*, artificial separation from other organisms), and by the form, color, and general appearance of the colonies it produces, and its mode of growth, both in plate cultivation, in tubes, and in drop cultures.

3. The organism thus identified must occur in the blood or tissues, not merely on the surface (cutaneous or intestinal), but below the epithelium, in the lymph-spaces or bloodvessels, *in every case of the disease in question.*

4. It must not occur in the human body, except in cases of the particular disease in question.

It may, however, conceivably occur in other animals without giving rise to the same pathological symptoms, or in air or water—as of course it does occur in the test-tubes and plates of "pure cultivations."

5. When a pure cultivation of the organism is introduced into the blood and tissues of an animal, the *phenomena* (*clinical and anatomical*) of the disease in question must be reproduced.

6. From that animal a "pure cultivation" must be again capable of reproduction, from which another animal may be again infected, and so on.

Now, taking the first canon, we would ask, Are the clinical and anatomical features distinct and constant? We have given data enough to show that they are not. Dr. Klein, in his description of the lesions in acute miliary tuberculosis, marks the sharp distinction into two forms.

And yet we have Germain-Sée, in his work on *Bacillary Phthisis*, making the following statements:

"1. The unity of phthisis, comprising all *acute* and *chronic* manifestations. There exists no dualism between tubercle and caseous pneumonia; no distinction between tubercular phthisis and inflammatory phthisis."

"2. Analogy, even identity, of tubercular nodule with inflammatory nodule from the histological point of view."

This is exact science with a vengeance.

Professor Hamilton, in his work on *The Pathology of Bronchitis*, speaks of disseminated catarrhal pneumonia. He says:

"The most curious point about these deposits is that they have not the slightest tubercular structure, but in all respects are identical with what is seen in the second stage of catarrhal pneumonia; they are small isolated groups of air-vesicles filled with epithelial products, the group invariably caseating in the centre. Every one has exactly the same appearance; there is not a vestige of any giant-cell structure; there is nothing of an interstitial character in the nodules. The whole process is one of catarrhal accumula-

tion in the air-sacs, followed by necrosis of the mass; and the only difference between this and ordinary catarrhal pneumonia is in the fact of the nodules being small in size and isolated in character, and universally disseminated throughout the lung substance."

We have pointed out that these nodules always contain numbers of tubercle bacilli.

In speaking of Koch's axioms, Dr. Pye-Smith (*loc. cit.*) says:

"The microörganism of tubercle is believed to be constant, specific, and pathogenic, but its relation to much of what is clinically and anatomically called tubercle in man is not fully established. Here the first of the above conditions is wanting."

Here, then, at the outset we find the tubercle bacillus not filling the first of the conditions established by its discoverer as essential to its position as the virus of the disease.

Secondly, if we take the question of size, the bacillus tuberculosis is at once separated from that found in bovine tuberculosis, although the reaction to staining agents is the same.

Next, in its staining properties it is not distinguishable from the lepra bacillus, from the numerous bacilli found in birds and other animals, the account of which has been already given, or from a form of micrococcus isolated by one of us from urine. These cannot be tubercle bacilli, as they do not produce the disease in the animals in which they are found. We shall have something to say on the mode of growth in cultivations later on.

Thirdly, this canon is not fulfilled by Koch's tubercle bacillus, as Koch himself has recorded cases where the disease existed and no bacilli could be found. We have shown that such has also been our experience in a number of cases.

Fourthly, to answer this canon the particular disease must be accurately defined.

Fifthly, we have proved that the induced disease by inoculation in the lower animals has no features similar either to reticular tubercle or caseous phthisis.

We have then a microörganism which is considered by many to be firmly established as the virus of a disease, to establish which connection its discoverer has laid down a set of rigid laws, and we find that this microörganism does not fill the conditions of any one of these laws.

It may be asked how has the microörganism arrived at this anomalous position? The answer is simple. This solution of the tubercular problem took a vivid hold on the imaginations of many men, the majority of whom had no special training for histological or pathological work. It was carried by acclamation, and any questioning of its position was received as little short of blasphemy. Even at the present

day there are some men who seem to consider it a personal insult to them to doubt the infallibility of the tubercle bacillus. We have, however, been working for a number of years on this question, and we wish to bring before the medical profession our views founded on actual practical work, and we feel sure of fair criticism from those men who are capable of looking at both sides of a question.

These diseases of the lungs cause such misery and such a large percentage of deaths that any addition to our knowledge of their causation can only act beneficially on the human race. When we see the divided opinions concerning these diseases held by our best men, we cannot but feel that the end is not reached yet, and when we consider the enormous amount of work that has been done in bacteriology generally, and especially in connection with tuberculosis, in the last ten years, we stand appalled at the very slight (if any) benefit we have derived from it. In our treatment of these diseases we cannot but think that the investigations have been made in the wrong direction. To think that men should be content to consider the virus of a disease found, and yet to remain without any further means of combating that disease after this discovery, would be an impossibility, and this is proved by the immense number of remedial measures brought forward, all to be faithfully tried, and all to fail.

We cannot help thinking that the chemical side of the question has been almost entirely neglected. What have the chemists told us about caseation; of what is it composed; and is it in all cases an identical chemical substance? This is a most important question, and one that ought to be fully worked out. It would then be shown whether the substance produced by the disintegration of reticular tubercular formation is identical with that found after the breaking down of consolidation following broncho-pneumonia. It is nonsense to assert that these are the same, and that they are caused by a specific microörganism we want chemical proof.

We have lately had a case which was diagnosed during life as phthisis. There was a large amount of consolidation ending in the formation of cavities. A number of guinea-pigs were inoculated with sputum from this case, and the bacilli were so numerous that it was used for practical class demonstration. At the post-mortem examination there were the usual appearances of phthisis pulmonalis, yet the microscope revealed the fact that the case was one of croupous pneumonia, the consolidation of which had not undergone resolution. Not one of the guinea-pigs inoculated developed the so-called tuberculosis. They all had large abscesses at the seat of inoculation, containing fluid pus, with numbers of tubercle bacilli, but in no case were the lungs affected. In one case there were some abscesses in the liver and spleen, and one guinea-pig is still living, seemingly unaffected, the inoculation

abscess having healed. Whatever may be the true explanation of this case, the fact remains that sputum taken from a case where the lung is rapidly breaking down after croupous pneumonia, and which sputum was loaded with bacilli, did not produce the lesions in the guinea-pig that we may confidently look for when using sputum from a case of phthisis pulmonalis.

We think that if the fact were universally admitted that cavities in the lungs were formed by two distinct methods we should be better able to treat these diseases—as one form that of the inflammatory kind, is distinctly amenable to treatment if taken early enough, and if the lesions in these inflammatory cases were recognized at an early stage we are confident that more cures of cases of phthisis would be recorded, although the tendency of the present time is certainly in that direction.

With regard to tuberculosis proper it is probably an incurable disease, as is cancer, when occurring in an internal organ; at any rate, in the present state of our knowledge of these diseases, associated with the formation of new and alien tissue.

It may be thought that we should express some opinion as to the part the bacillus tuberculosis plays in these diseases. Here we are met by a difficulty. It seems beyond a doubt that this microörganism is intimately associated with caseation, and we know that it is never absent from that degeneration when it follows phthisis pulmonalis; but we also find it in degeneration of tubercular new-growth. Now, the question arises, Are these the same bacilli?

We have shown that in bovine tuberculosis the bacillus has the same chemical reaction as that of Koch, and yet it is much smaller. We know from careful and repeated observations that the bacillus varies in size considerably in various cases of phthisis; more especially is this noticeable in cases of acute phthisis or galloping consumption. Here the bacilli are large, long, and contain numbers of so-called spores. In other cases the bacilli are much smaller and shorter. Another point we have observed is, that in scrofulous glands removed from the neck and placed in spirit, after some years the bacilli lose their power of reacting to the specific staining agent, and before this power is quite gone—that is when they have not been so long in spirit—they will stain fairly well, but the reaction completely disappears in twenty-four hours, although bacilli in sections of lungs kept many years in spirit took the same stain well and still retain it. We have already pointed out this peculiarity in the bacilli of bovine tuberculosis. There are several cases on record where the mesenteric glands have been found after death changed into masses of calcification. This is what we have already pointed out as occurring so often in bovine tuberculosis. We

have a number of cases in which tabes mesenterica was directly traced to the ingestion of cow's milk.

Is it possible that tuberculosis, as we understand it, has any distinct relation to bovine tuberculosis, through infection from the milk of a tuberculous cow? This has occurred to us as a possibility, and as such we bring it to the notice of the profession. We should then have two forms of tubercle bacilli, the one derived from an outer source, and producing tuberculosis, either directly or through some poisonous product, this might take place in a gland or other part. This gland, becoming caseous first, would after a time infect the whole organism, and this infection would take varied forms, according to the situation of the part first infected, and its means of communication with the rest of the body. The other, a bacillus having a similar chemical reaction to the first, but associated in some way with caseation. It cannot be the cause of the disease here, as we find it in cases where we have bronchitis extending into the lungs, and causing broncho-pneumonia, the consolidation so formed not clearing up, but breaking down, and containing numerous bacilli with specific reaction. To explain it by the theory that there is a specific and a non-specific broncho-pneumonia seems to us to be a very lame way out of a difficulty. We do not give this idea as mere theory, but we have some facts which have induced us to consider the matter, and we are carrying on a series of investigations on these lines. There may be nothing in it, but we would ask the kind consideration of those men who are not wedded to the unity of phthisis on this point.

As to heredity and contagion our work is still in progress, and it will take a much longer time than we have yet devoted to these questions before we can get reliable data to work on. In the meantime we would say that the results we have laid before the profession are those of honest work, and all we ask is fair and open criticism of this work by those competent to do so.