

shows the slaty-blue colour, and under a low power of the microscope it appears as if the normal elements had been completely replaced by the rose-pink amyloid material. In these places the liver structure is totally obliterated, and it is quite impossible to say whether the amyloid masses are composed exclusively of altered capillaries, or partly of waxy liver cells. But in such parts as still show recognisable liver cells, these, as in the horse's liver, are free from the amyloid substance, but are generally deformed, fatty, or atrophied. The middle coat of the smaller arteries is waxy throughout, but the wall of the large branches appears healthy. Occasional streaks of rose-pink are discernible in the wall of the small and middle-sized branches of the portal vein.

The peripheral non-caseated zone of each tubercle nodule is composed of cells of various kinds, with numerous capillaries and occasional small arteries with a distinct middle coat. These vessels are invariably waxy, but in the arterioles the endothelium is obviously free from the amyloid substance. For the most part the cells adjoining the caseous material are spindle-shaped fibroblasts with a few multinucleated giant-cells, and farther outwards the former have advanced to the condition of young fibrous bundles. At some places there are clumps of small round or lymphoid elements, and in the case of some of these it almost seems as if they were infiltrated with the amyloid substance. By careful examination, however, with a high power I have convinced myself that such is not the case. Where a group of rose-pink cells is discernible with a low magnification, a higher power shows that it is in reality a fragment of a waxy capillary with small round cells which have clustered round it, or which in some cases appear to have actually penetrated it.

Lastly it is to be observed that diffuse rose-pink streaks and patches lie in the part which is completely caseous, showing the greater resistance of the amyloid substance, as compared with the non-amyloid elements, to the process of caseation.

There can be little doubt that in this instance the amyloid disease arose out of the tuberculosis. The turkey, which was four years old, had never exhibited any symptom of disease, but during life the liver could be felt through the abdominal wall, and by the poultry-keeper it was thought to be an egg which for some reason or another the bird was unable to lay. The turkey was killed because it had not laid any eggs during the previous year. The only other organ that showed tubercular lesions was the heart.

ON PLEURO-PNEUMONIA AND ITS PREVENTION.¹

By JAMES M'CALL, F.R.C.V.S., Principal of the Glasgow
Veterinary College.

THE subject on which I have been desired by the directors of this Society to address you this evening is the disease—pleuro-pneumonia in cattle, and as a discussion has been suggested to follow thereafter, I

¹ An address delivered to the Renfrewshire Agricultural Society, 14th November 1889.

shall restrict my observations to a few of the points which are of most importance to agriculturists, and on which, it may be presumed, they have formed or are desirous of forming an opinion. The term pleuro-pneumonia in medical language is used to signify an inflammation of the lungs and their covering the pleura—a disease that affects all warm-blooded creatures; but the pleuro-pneumonia which we are met to consider attacks no other animals save the bovine race, and is not transmittible to any other.

The name then is evidently a misnomer, and it should long ere this have been discarded.

Cattle, like other animals possessed of lungs, are subject to attacks of inflammation of these organs, and for a simple inflammation of the lungs the term pleuro-pneumonia is appropriate; but cattle are also liable to attacks of another disease in which the lungs are, as it were, secondarily implicated, but which is as different as regards the cause of the inflammation as any two diseases that can be named.

In the living subject simple pleuro-pneumonia and contagious pleuro-pneumonia (without the history as to cohabitation and other particulars) are in most cases indistinguishable, and the same may be said on *post-mortem*, unless to the eye of the experienced expert.

The pleuro-pneumonia to which all animals may fall victims can originate from a variety of causes, as, for example, exposure to cold, and other conditions with which all are familiar, but the pleuro-pneumonia under consideration can only originate from *one cause*, viz. a living organism or parasite. The disease is therefore a truly specific parasitic affection, and the lung affection is but the local manifestation of the malady.

As regards the origin of this living organism, we veterinarians are in the same position as our medical brethren with regard to the origin of the specific organism of small-pox—in more direct language, we do not know its origin.

But I assert that it is the entrance of these specific microbes into the lungs of cattle in the act of inspiration, and their growth, reproduction, and multiplication, which set up the series of changes in the lungs terminating in inflammation, and to which the name pleuro-pneumonia is given.

Origin of Specific Diseases.

All specific diseases in my opinion owe their origin to specific living organisms, the chemical substances which they generate or excrete, and the joint action of these on the liquids and cells of the body.

These organisms are indigenous to certain countries or districts; they will only live in certain animals, and as a rule they will only breed in certain tissues of that selected body. Many, if not most of these organisms, belong to the vegetable kingdom, are indeed vegetable parasites or fungi; and in being indigenous to certain countries, living in the bodies of certain races of animals, are they not, I ask, obeying the same laws as regulate development and growth of the higher forms of vegetable life, and with which, as agriculturists, you are so familiar?

No doubt there are present some gentlemen who believe that this

lung affection can originate from other causes—from abuse in the transmission of cattle by steam-ships and railways, from exposure to cold in markets, auction sales, and from bad ventilation and filth in their habitations and surroundings. There are no doubt persons also present who do not believe in the propagation of the disease by infection or contagion, and who advocate and cite cases to prove a spontaneous origin.

Now let me address myself briefly but earnestly to all such.

Sporadic or simple inflammation of the lung and its covering, with which, as I have already said, the disease under consideration is frequently confounded, and that, too, by veterinarians, may and does originate in the manner indicated, and hence may be spoken of as having a "spontaneous origin;" but specific diseases cannot originate from any or all such conditions, even if combined.

It is a living organism which is the cause of the malady, and living organisms cannot be evolved out of lifeless organic or inorganic matter. True, it is a low form of organism, but whether high or low, if possessed of life, it must have had a living parentage.

Some no doubt are here who refuse to subscribe to any such doctrine of the origin of life, and pertinently ask, If this disease is dependent on a living being, and if its propagation is by infection or transmission of the living being from diseased animals to sound, how did the first cow become infected, and from whence came the infecting agent or living organism?

Instead of attempting to give a direct answer to these questions, I shall in turn put a case or two in point for answer, and shall intentionally select objects with which all are familiar.

I show you an acorn, out of which, as you know, the majestic oak is developed; and as it must be clear to you that the first oak could not have been developed from an acorn, which is the seed of an oak, how was it developed? or in other words, how did the first oak originate?

Again, I place before you an egg out of which, if fertilised, a chick is produced, and as chicks never appear without being preceded by eggs, it is said the chick originates from the egg; but I need scarcely say that the origin of the first chicken was by no such method, and while you may believe you can, you cannot, explain or demonstrate how the first chicken originated. You must admit that their propagation and continuation on the face of the earth now is, and has been, by parentage; and when you can explain how the first chick originated, I shall, using that information, attempt to explain how the first specific organism of pleuro-pneumonia sprang into being.

"The origin of all specific diseases, or how their respective first contagia arose, is alike unknown. This in pathology is just such a question as in physiology is the origin of species."

Daily observation convinces us that the contagium of glanders will breed glanders; the contagium of foot-and-mouth disease, foot-and-mouth disease; the contagium of tuberculosis, tuberculosis; the contagium of rinderpest, rinderpest; the contagium of small-pox in man, small-pox; the contagium of small-pox in sheep, small-pox in sheep; and the contagium of pleuro-pneumonia in cattle, pleuro-pneumonia, and so on, with other specific affections I might mention, did time permit.

The contagium of small-pox in man will not breed small-pox in

sheep, nor the contagium of small-pox in sheep, breed small-pox in man.

The process, in one sentence, is as regular as that by which sheep breed sheep ; pigs, pigs ; and cattle, cattle ; and quite as exclusive as that by which sheep never breed pigs, nor pigs, sheep.

If a discussion is to follow, and our conference is to end in intelligent practical suggestions, we must be at one as to the nature of the malady we desire to suppress ; and, I repeat, that unless this lung affection be a specific disease and not a constitutional disease, that it be a disease not indigenous to this country, and that it spreads by contagion and does not originate spontaneously, then it matters little what your suggestions are ; they may limit the spread of the malady, but they will fail in its eradication.

Veterinarians in Ignorance of its Nature.

According to paragraphs and some rather pretentious articles which have appeared in various newspapers, veterinarians know nothing of the nature of this lung malady, and some of our medical friends desire to be provided with funds to investigate its nature. Now I do not object to any individual or body of men embarking on such an expedition ; but I ask, What has the medical profession done in the past to warrant such an application, or do they know so much more of the nature of specific diseases in general, or even of specific diseases in special in mankind, as to warrant their usurping the place of veterinarians ?

Let us cast a little light on this point ; and with this object in view, we will briefly contrast the specific disease small-pox in man with the specific disease pleuro-pneumonia in cattle.

Small-pox is classified by medicals as a specific disease, and so is pleuro-pneumonia by veterinarians, because both are highly infectious diseases, have a period of incubation, attack certain structures or organs, write specific lesions on these structures, and are transmissible from diseased to healthy subjects by inhalation of the contagium, or by inoculation of the morbid products formed in the course of the malady.

In both affections the inoculated malady is more benign than the natural malady ; and without raising the question as to whether the so-called variolous and vaccinous blood poisons are distinct or modified forms of the same blood poison or contagium, in both diseases preventive inoculation has proven itself a success, provided the subjects inoculated had no spores or seeds of either malady in their system at the moment of inoculation.

Now we come to the microscopic observations and their teachings or results. In the morbid products of small-pox and vaccine pox, microbes or organisms belonging to the class micrococci have been found ; and in the lung lymph which we use for inoculation in pleuro-pneumonia, micrococci have also been found, and thus far you observe the veterinarian knows just as much regarding the nature of pleuro-pneumonia in cattle as our medical advisers know regarding the nature of small-pox in man.

An eminent medical authority, writing as to inoculation in pleuro-pneumonia, thus delivers himself : " It is abundantly evident that in

employing inoculation *as at present practised* we are working in the dark. We want to be certain whether the essential part of the virus is a living organism, what that micro-organism is, and upon what it grows, and whether it germinates rapidly or slowly. These are questions of the deepest scientific interest and practical importance. They are matters about which we know practically nothing, and I think I am perfectly justified in saying that, until we do know *something* about them, we shall not advance one step beyond the stage in which we are at present."

With much that is here stated I am in sympathy, and more particularly with that craving for knowledge of a more definite and specific character ; but with all deference I maintain that our medical friend's strictures are quite as applicable to the members of his profession, including himself, in regard to the knowledge they possess of small-pox, as to veterinarians with regard to the knowledge they possess of pleuro-pneumonia.

Let us see if it is not so.

At one time, as you know, inoculation was practised as a preventive remedy in small-pox ; but after Jenner's discovery of the protective virtue of cow-pox virus, it was discarded and vaccination substituted.

Now, I ask, was no advance made on the treatment of small-pox by the substitution of vaccination for inoculation? Undoubtedly so, but I would go further, and assert that *no improvement of any consequence* has been effected in the treatment of small-pox since Jenner's day, when, I think I am justified in saying, the microscope as an instrument of research in human pathology was unknown, and micro-organisms, the germ theory of disease, and the artificial cultivation of microbes were undreamt of.

But let us now touch on the points raised.

It is asked, Is the essential part of the virus of pleuro-pneumonia a living organism? In the meantime, I in return ask, Is the essential part of the virus of small-pox a living organism? I assert that in neither disease can a positive opinion or answer be given. In both diseases "germs constitute the agency of production ;" but the chemical substances produced in all probability give rise to the symptoms which indicate the disease.

Without, in the meantime, stating dogmatically what the living organism of pleuro-pneumonia in all probability is, I shall refer to the work done in this direction by Veterinary-Surgeon Poels and Dr Nolen of Rotterdam. These gentlemen, having conducted investigations and experiments on a most extensive scale, issued a report, a synopsis of which will be found in *The Veterinarian* of March 1887 ; and as my own observations and experiments rather tend to corroborate the views they have expressed regarding the specific character of the microbes found in pleuro-pneumonia, I shall read to you the concluding paragraph of their joint report :—

"If we now review the results of these investigations, not only each one by itself, but looking at them at the same time in their connection with each other, namely, that the coccus we have described is always found in great numbers in the exudation products of lungs affected with pleuro-pneumonia, but not in healthy lungs ; that the *same* micrococcus is also always found in the healthy reaction succeeding inoculation, and on being developed in pure cultivations can be suc-

cessfully used for the purpose of inoculation ; and lastly, that the coccus can in a few days produce extensive pneumonic changes in a bovine animal, we think we are justified in concluding that *this coccus* is the contagium of pleuro-pneumonia."

These experiments, I may further mention, were made on 800 cattle, and a large number of rabbits, guinea-pigs, mice, and dogs. The lymph was taken from the lungs of sixty cattle in various stages of the disease, and the cultures were made with blood-serum, meat extract, peptone gelatine, gelatine plates, potatoes, etc.

Had time permitted, I would gladly have referred to the excellent work performed by others having a similar object in view. Undoubtedly, micrococci and bacilli are present in the exudation of pleuro-pneumonia, and undoubtedly one or other is specific to the malady ; but as we cannot transmit the *recognisable* lung lesions in any other practical way than by cohabitation of the diseased with the healthy, it follows, as a necessary consequence, that it is a most difficult point to decide whether the pathogenic microbe of pleuro-pneumonia is a micrococcus or a bacillus.

But to proceed, in the body of the ox the organism of pleuro-pneumonia, when inhaled, will only grow and breed in the connective tissue of the lung, drawing its sustenance from the lymph streams so numerous in this situation.

If inoculated locally, *e.g.* on the tail, the microbes produce no local action for about ten days, and that action is confined to the tail or parts in its immediate neighbourhood, the lung never becoming inflamed or presenting lesions such as are always seen on autopsy when the animal has contracted the disease by the natural method—inhalation of the virus.

Much has been made of this fact by those who refuse to believe in inoculation, but to my mind it is no objection to the value of preventive inoculation. Admitting, for the sake of discussion, that when we inoculate we do not produce the disease, if the animal on being subjected to the crucial test of inhaling the virus can do so with impunity, it must be granted that inoculation did one of two things, *viz.*, it either induced the disease in a modified form, or it exhausted the body of the material naturally present in it, and on which the pathogenic microbe of pleuro-pneumonia lives and reproduces itself, and in either way, or whatever way, it results, inoculation remains a success.

Regarding its power of germinating, and the time required, that varies just as the germinating of seeds which we sow.

The shortest period of incubating and germinating by inoculation of the virus is ten days, and the shortest, and at same time, average period of incubating and germinating by the natural method, is six weeks, and experimentally induced, I have found it so almost to a day.

When a sound cow receives the contagium by breathing the air expired by a diseased cow (and all experimental evidence goes to prove that this is the only way the malady can be communicated), it produces, as I have said, a lung disease and an infectious malady ; but when the disease by inoculation is grafted on the body of a previously sound animal, it reproduces no infectious malady.

How much more than this, I ask, do our medical friends know

regarding the contagium of small-pox and the protective influence vaccination exercises over it?

In the pox on the body of the small-pox patient there are organisms destructive to human life. In the pox on the arm of the vaccinated subject there are organisms, not destructive to life, but destructive apparently to the small-pox organisms or the deadly poison they excrete, and if *first* implanted they enable that individual to breathe with impunity an atmosphere loaded with small-pox organisms.

Medical bacteriologists have failed as yet, I repeat, in singling out the organism of small-pox, or in growing it outside of the body of the child or calf. To keep it alive they have recourse to successive inoculations from calf to calf, or from child to child; and because they have as yet failed to demonstrate the organism and its life history (all, no doubt, of great interest and value), are they prepared to be told that they are groping in the dark; that they know "practically nothing" about the malady; and that until all these points are cleared up, vaccination should be discarded and men allowed to fall victims to small-pox?

Jenner, I repeat, knew nothing of living organisms and their cultivation in the sense now known, but in substituting vaccination for inoculation he did more to conserve human life than any other man. And while I am an opponent to inoculation on grounds yet to be stated, I cannot but admit, and do so with pleasure, that those gentlemen who have practised "preventive inoculation" have thereby conserved the life of many an animal that, under any other method of treatment, would have fallen a victim to the lung plague.

Having thus briefly, and I admit very imperfectly, referred to the pathology or nature of pleuro-pneumonia, and hoping that I have shown some reasonable grounds for asking you to believe that it is a truly specific disease, and can only be propagated by the contagium of the living diseased animal, I shall now refer to the measures at present adopted for its extinction.

Measures adopted to Eradicate the Disease.

Before doing so, for the information of those who may not have had an opportunity of reading the literature which has been written on the appearance and spread of pleuro-pneumonia in the various countries, I may state that the first authentic record of the malady in all probability emanated from the pen of Bourgelat (founder of the French Veterinary College) in the year 1769. I shall not refer to other writers by name, but content myself by stating the year in which the disease appeared in the various countries, and I do so more especially for the purpose of proving to you that the disease is not indigenous or native to this and many other countries.

The disease appeared in Prussia and Germany in the year 1802; in Russia in 1824; Belgium, 1827; Holland, 1833; Great Britain, 1841; Sweden, 1847; Denmark, 1848; Finland, 1850; Cape of Good Hope, 1854; United States of America, 1843; Brooklyn, 1850; Melbourne, 1858; Boston, 1859; New Zealand, 1864.

Its introduction to this country is generally believed to have been from Holland; but from whatever country it was introduced, it was

undoubtedly imported in the body of a living bovine animal, for all attempts to convey or spread the malady by indirect means or "mediate" contagion have failed.

The Government measures which have been adopted for the extinction of pleuro-pneumonia in this country from the year 1873 till 1888, have been slaughter of affected animals and isolation of the remainder of the herd for fifty-six days from the date of slaughter of the last affected animal.

In Glasgow this isolation has been, practically, until the whole herd has been slaughtered.

The dairymen find it to be their interest to milk and feed for the butcher, and, when the cow ceases to pay her keep by the milk produced, she in general is sold in the byre and taken direct to a slaughter house.

Prior to the passing of the Contagious Diseases (Animals) Act in 1869 the annual loss from this disease, to the dairymen of Glasgow, on an average of twelve years, reached the large sum of £4556.

For the three years and four months after the passing of the Act, from August 1869 to December 1872, the average annual loss was reduced to £650.

In August 1873 an Order was passed empowering Local Authorities to kill all affected animals, and pay compensation at the rate of one-half the value of the affected beast.

In 1875 another Order was passed, raising the compensation to three-fourths of the value, and I find that the annual loss from August 1873 to January 1887 amounted to £450.

In March 1888 another Order was passed, compelling Local Authorities to slaughter all cattle affected with pleuro-pneumonia and all cattle in contact with such animals, and to grant compensation for affected cattle at the rate of three-fourths value, and for non-affected animals at full value; and I am glad to be able to state that even this severe measure has but slightly increased the amount hitherto paid as annual compensation.

It is thus evident that in Glasgow the Government measures have curtailed the spread of the disease and greatly reduced the average annual loss, and I think they may be said to have had the same effect more or less all over the three kingdoms; but, notwithstanding, the malady is at the present time widespread, and it has been attempted to show that this wholesale slaughter of animals instead of curtailing has increased the spread.

Granting that the disease is as widespread as it has been at any former period, it is absurd to say that the slaughter order is the cause or has anything to do with its increase. It is the living affected animal that spreads the malady, a dead affected animal or its carcase cut up neither carries nor gives off contagium.

Even the living animal when inoculated with the virus at the tail or behind the shoulder, or anywhere externally, gives off no contagium. The contagium only leaves the body in the breath, and so soon as the body is cold and the breath ceases to issue from the lungs, the power to infect is gone.

As I have stated on former occasions, fix the one end of a funnel around the nose and mouth of a markedly affected cow, and the other end around the mouth and nose of a sound one; let the sound animal

thus inhale the contagium, and with certainty you will transmit the disease ; but take the diseased lungs after they are cold and place them so that the animal must breathe over them, and the animal will not contract the malady, at least, that has been the result of such experiments.

Slaughter may not, indeed in my opinion cannot, be successful for a length of time in vanquishing the disease ; but if all affected animals be slaughtered, it is clear that the disease, not being indigenous, must cease in this country with the slaughter of the last affected animal. That has been the experience and result of a vigorous administration of the Slaughter Order under Government control in Holland, Norway, Sweden, Switzerland, Luxemburg, and Baden.

I admit that there are difficulties in the way, but they are not unsurmountable, and the success which attended the Slaughter Order in stamping out rinderpest in the year 1866 ought to stimulate and encourage us in our warfare against pleuro.

It is, I must admit, a much more difficult and insidious disease to deal with than rinderpest, the long period of incubation and the slight abnormal symptoms exhibited by many affected animals leading to delay and hesitancy in ordering slaughter and in carrying it out.

The Slaughter Order it is said is a great failure. As a measure of extinction it is no failure, and its small success as yet is entirely due to its execution being left in the hands of so many individuals and parties having conflicting interests to serve and prejudices to satisfy.

But how many of those individuals who advocated a slaughter policy prognosticated that a year or two would see the disease "stamped out?" Not one individual known to me, and certainly I did not when giving my evidence before the Departmental Committee in London. I knew too well the disease and the individuals in whose hands the Order was left to be worked out, to express so hopeful an opinion.

Each Local Authority frames its own regulations, and that too, in most cases, without the slightest regard to the effect they may have upon their nearest neighbour, and often on contrary lines.

One Local Authority loyally carries out the provisions of the Orders as issued by the Privy Council, another Local Authority connives at their evasion, and others openly refuse to have anything to do with them even when specially desired by the Privy Council to do so.

Is that, I ask, the way to attack an insidious disease and to expect victory? Certainly not. It is uniform and combined action all along the lines of attack which is demanded, and without this our efforts at extinction will fail.

The remedy then is, place the working of the Slaughter Order in the hands of a central authority—the Minister of Agriculture—and stipulate that the money paid in compensation shall be drawn from the Imperial funds. By such, or some such arrangement, uniformity of action, and uniformity in regulations, without unnecessary complication and vexatious restrictions on the movement of cattle, will be secured all over the country ; and Government having to supply the funds—the sinews of war, will see that the battle is as short and decisive as it is in the power of men to make it.

But, while I advocate a central authority and payment of compensation from the National Exchequer, as the speediest and most

effectual way of extinguishing the disease, I leave it to the Local Authorities of counties and burghs to see that their individual interests are preserved, and that the burghs are in no way burdened to relieve the counties, or the counties to relieve the burghs.

And now, gentlemen, we shall direct our attention to the combating of pleuro-pneumonia by the method known as inoculation.

Inoculation.

The opponents to wholesale slaughter, seeing, as they say, "it has signally failed," recommend slaughter of affected animals and inoculation of the other members of the herd.

Now, the very fact of recommending and insisting on slaughter of all affected animals is a direct confession that inoculation is of no use in stopping the progress of the malady when once it has attacked its victim, and I desire that you will keep this point prominently before you in the discussion which is to follow.

If inoculation can stay the ravages of pleuro-pneumonia when once contracted, then, I ask, why slaughter all affected or suspected animals, and only inoculate those believed to be sound?

But to continue, inoculation is an undeniable preventive remedy. Theoretically, you may work it out on paper to be otherwise, but in practice, and with no bias in its favour, it has proven itself to be under my own observation a reliable preventive agent.

Given a sound animal, an animal that never breathed in an atmosphere where pleuro-pneumonia has existed, and let the animal be inoculated with genuine vaccine, it will show itself proof to the invasion of the malady when placed in a cowshed where pleuro-pneumonia exists, and thus compelled to breathe the virus.

Now, if the veterinary surgeon, when an outbreak of pleuro occurs, could with certainty pick out all the affected animals and have them slaughtered on the premises, and all the sound cattle there and then inoculated with genuine vaccine, the disease would cease. But, unfortunately, no veterinarian has as yet been able to devise a method for its detection in the incubative stage of the malady, which covers a period of six weeks at least.

Further, that animal, although having the spores or seeds of the disease incubating (hatching) in its lungs, will receive inoculation, and the parts inoculated will present the same appearances as in an animal in whose lungs there are no seeds of disease.

Still further, when an animal is attacked with this disease by the natural method, there is a marked tendency for the organisms to work together in the lungs, and for a sack or cyst or boundary wall to form outside their operations.

When this sack has been completed, if the animal is robust and the remainder of the lungs healthy, the fever gradually subsides, the temperature becomes normal, the disturbed breathing disappears, and as this portion of encysted lung may be buried deep in, and surrounded by, healthy lung, here again the veterinary surgeon is at sea, and fails in detecting the diseased animal.

He inoculates such animals; the changes produced by the operation are the same as on subjects having healthy lungs, and the animals in due course recover from the operation. They remain where they are,

or are sold to other parties, it matters not which, if allowed to live; the day comes when the cyst wall bursts and opens into a bronchial tube; a new portion of lung is attacked, the animals give off the organisms in their breath; they again become sources of infection and, wherever they go, spread the disease.

If any such animal remains in a herd, it will, in due course, give the malady to all fresh purchases, and, in proof of this, I will now cite my own experience in one stock. In the month of February 1887 pleuro-pneumonia attacked a herd of thirty-seven cows, and after slaughtering three cows, it was determined by the owner that the remaining thirty-four should be inoculated. The operation was accordingly performed, and with every care and ability.

Eight days after the operation one of the inoculated cows showed symptoms of pleuro-pneumonia and required to be slaughtered, and within a period of six weeks *nine* cows in all had been killed, all found to be labouring under the malady.

The remaining twenty-five cows, showing no marked symptoms of disease, were allowed to remain in the cowshed, and the restrictions on the expiry of the fifty-six days were removed.

In the month of June of the year following, viz., 1888, my attention was again drawn to this stock, and I had no difficulty in again declaring the presence of the disease in several of the herd. But, and in consequence of the Compulsory Slaughter Order, I had now to order slaughter of every animal in the stock. It again numbered thirty-seven cows. Now, mark the results. In the herd were four cows still remaining that had been inoculated during the first or prior outbreak of pleuro, and these four cows, believed to be sound and protected by the inoculation, on being killed were found to have disease of their lungs of old standing. The cysts in two animals communicated with the bronchial tubes, and through the bronchial tube a whale-bone probe could with facility be passed into the sacks.

All the animals except four cows had been inoculated, and every one of these four on *post-mortem* was also found affected.

Seven other cows purchased after the cessation of the first outbreak, but all of which had been inoculated, were also found to have diseased lungs, and the remaining twenty-two cows, also inoculated, were found free of any trace of pleuro-pneumonia.

Such is the history of the first and second outbreaks of pleuro-pneumonia in this man's herd; and to an observer willing and able to balance the facts disclosed, it is evident that any one of the four cows inoculated during the first outbreak was able to keep up the infection in that herd, and undoubtedly two of them at the time of death were actively throwing off the poison or contagium from their lungs.

But while I feel compelled to point out to you wherein inoculation in this herd had proved "a delusion and a snare," I desire also to specially direct your attention to the great fact, that while not one of the non-inoculated animals escaped the malady, twenty-two of the inoculated did, thus adding another to the many triumphs that inoculation has achieved in sound animals.

I say again it is not a difficult matter on paper to construct a theory regarding specific diseases and their treatment by inoculation, and to say, that if a given specific disease does not square itself accordingly,

inoculation has no virtue and no preventive action ; but if in our practice we find it otherwise, then I hold that practice is right and theory is wrong.

What I have stated are my principal objections to inoculation as at present carried out, and they appear to me insurmountable. If slaughter of affected animals and inoculation of *apparently* sound (for no man can guarantee that) should be substituted for slaughter of all affected herds, then no inoculated animals should be allowed to leave the premises where inoculated, unless on a conveyance to the nearest slaughter house.

In town dairies such a procedure could be carried out without much inconvenience to the dairymen, and at a considerable saving to the community ; but on farms, where parties breed and graze cattle in the fields, it is unworkable.

If inoculation is to rid the country of pleuro-pneumonia, then, it must be no half measure, but a system of inoculation whereby every calf born in the country or imported shall be subjected to the operation with as much regularity and certainty as children are vaccinated.

Veterinarians are prepared to offer their services, and there are men in the profession able and willing to provide the lymph and supervise the whole operations ; but have you thought of the number of persons, professional and non-professional, that will be required not only in carrying out the work of inoculation, but also in preventing deception ? Parents, as a rule, are willing and anxious to have their children vaccinated, and resistance and evasion is seldom practised ; but I fear the evasions on the part of stock owners would be many, and therefore the machinery required to make the system a perfect one could not but be attended with an enormous expenditure of money.

Slaughter of whole herds, sound and unsound, is, I admit, a cruel and revolting policy, but you are shut up to it, or to the policy of universal preventive inoculation ; for treatment of this disease in the usual sense of the term is of no avail. Which of them then shall it be ?

Speaking for myself and my profession, if only from a selfish point of view, I would say universal preventive inoculation, but the difficulties associated with it are, I fear, insurmountable, the expense enormous, and no country that has tried it has succeeded.

All circumstances considered, would it not be our safest course in the meantime to memorialise the Minister of Agriculture to make the extinction of the disease and the granting of compensation the subject of Imperial legislation and control ? I think so, and if Government consent, then it will rest with them to decide whether they will continue to wage war against the malady by slaughter or by inoculation.
