

NOTES ON ACTINOMYCOSIS, AND ITS TRANSMISSIBILITY TO THE HUMAN SUBJECT.

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While I cannot but feel that some apology is due to the Royal Society for introducing a subject that might perhaps be regarded as purely medical, this feeling is removed by the consideration of its important bearing upon the public health, and may be held to justify me in bringing it before the Society. I refer to the question of the transmissibility of some bovine diseases to human beings by the consumption of the meat of diseased animals.

The primary object of my paper is to show that there is prevalent amongst the cattle in Tasmania, as well as in the adjacent colonies, from which we obtain a large proportion of our meat supply, a disease which resembles tuberculosis in some respects, but differs from it in the specific micro-organism that is the cause of the disease, and yet, like tuberculosis, is transmissible to the human subject, and is almost as distressing in its consequences.

Six years ago Dr. Perkins read an interesting paper before this Society on "Cancer in Cattle," and ably pointed out the probable danger of the use as food of animals affected with cancerous or osteo-sarcomatous swellings; and he urged that precautions should be taken to avoid the probable transmission of cancer to man by eating the flesh of animals so diseased.

As the tumours in the cases described resembled in external appearance those swellings that are undoubtedly due to a scrofulous taint or tuberculosis, Dr. Perkins considered that they also might be classed as such; and judging by his paper, he apparently was unaware of the true nature of the disease in question. He well described the appearance of the swellings, and, by microscopical and other specimens, he showed how the bone was affected, and how the tumours grew and formed secondary deposits in the system; but there is no mention of the specific micro-organism which is now found to be the cause of the growth.

At the time of his writing the paper there was no accurate knowledge available that would give any clue to the true cause of the cancer. Dr. Perkins himself did not regard it as ordinary cancer, for he says that "though I have examined several specimens, I have not yet come upon cells which in any way resemble those of cancer," and he favours the idea that the tumours are due to tuberculosis.

Previous to Dr. Perkins's paper, Mr. Willows, N.S.W. Government Veterinarian, in conjunction with Mr. Park of Hobart, was empowered by the Hon. the then Premier of Tasmania to report upon the alleged cancer in cattle of this colony. In his report Mr. Willows considered the tumours to be due to a tuberculous taint; and he urged that prophylactic measures be rigidly enforced with a view to stamp out the disease, and he concludes by saying, "I am of opinion that the consumption of meat or milk from scrofulous or tuberculous animals is always dangerous."

In Europe this disease, so far as it was judged by external appearances, had been long recognised, and was described under various designations, such as osteo-sarcoma, cancer, etc., and usually it was attributed to a tuberculous condition of the system affecting the glands.

It is only of comparatively recent years, since 1876, that these tumours have been demonstrated to be due to the presence of a parasitic fungus, called actinomyces or ray-fungus, from its ray-like appearance, and hence the disease is called Actinomycosis.

Soon after the publication of the discovery of the actinomyces or ray-fungus in diseased cattle, the same vegetable parasite was found in man; and it was then seen that the tumours in the bovine species presented great similarity to those found in the human subject, leading to the presumption that it was identically the same disease.

Besides cattle the actinomyces have been found in animals which have suffered from cancerous disease, as the pig, and the dog.

About four years ago Mr. Archibald Park who has carefully studied this subject, called attention to the presence of certain peculiar bodies in these cases of cancer, which he thought differed from true tuberculosis. And as the published accounts in the veterinary literature of the day, of the discovery of actinomyces in a similar disease to this cancer in Europe, agreed with what he observed in the cases in Tasmania, Mr. Park came to the conclusion that the disease in this colony must be the Actinomycosis of Europe.

Previous to his departure to England nine months ago Mr. Park brought me a specimen of one of these osteo-sarcomatous tumours from the lower jaw of a cow. Having made sections we examined them under the microscope, when the distinguishing characteristic club-shaped bodies of the actinomyces or ray-fungus were unmistakably seen, agreeing in all respects with the published accounts of the parasite, thus establishing the fact of the disease in Tasmania being undoubted Actinomycosis.

Having taken with him to England this same specimen, Mr.

Park showed it to the best authorities in London, who confirmed the diagnosis, and were much interested in the discovery.

Sections of the specimens referred to are now on the table for inspection, when members will be enabled to examine by the microscope the peculiar ray-fungus that is associated with the disease in question.

The fungus tufts vary in size from a pin's point to a pin's head, and may be readily seen with the low power of the microscope; but it requires a high power to distinguish the characteristic club-shaped bodies which are arranged in the form of a rosette, or in a radiate manner. When thin sections are cut the larger tufts drop out, leaving round vacant places which give the specimen a reticulated appearance.

Appropriate staining brings out very prominently three different elements which are easily distinguishable under the higher power; first minute granules, or micro-cocci; second, fine threads of mycelium; third, disposed in a radiate manner round the edge of the tufts, larger ovate or club-shaped bodies.

These three elements are not always to be found in the same specimen, and frequently the clubs are not seen, or possibly are not brought out in the staining; but when found they are deemed to be the characteristic element of the parasite. The discovery of this parasitic fungus has been the starting point for many valuable investigations; and it is surprising to find how many obscure diseases there are whose origin may be traced to the presence of this vegetable parasite, and many diseased organs thought to be suffering from tuberculosis have been found to contain the actinomyces, and not the tubercle bacillus.

Our chief interest in the fungus is centred in the fact that identically the same parasite as is found in the lower animals is discovered to be the cause of similar diseases in the human subject. Several well-authenticated cases have been published of undoubted Actinomycosis in human beings having a fatal termination. How these patients became inoculated with this disease it is difficult to say.

It has been shown by experiment that the introduction of the fungus by inoculation into a calf has produced swellings which contained the characteristic clubs of the fungus, thus suggesting that this disease can be transmitted by direct inoculation.

Many similar experiments have been made with a view to prove the transmissibility of this vegetable parasite from animal to animal, and in the majority of cases with a positive result.

There can be no doubt that, in whatever way the actinomyces are taken into the human system, whether by injection, inhalation, or inoculation, there is every liability of their growing and multiplying to the injury of the patient.

The fungus may find entrance by wounds and abrasions of the mucous membrane of the mouth and alimentary system, in a similar manner that other micro-organisms have been proved to enter.

Wherever they find a lodgment they proceed at once to develop, forming mycelial threads and spores; and just as in the case of similar parasites, they set free, in the vicinity of the parent fungus, spores, which give rise to fresh individuals. These spores are carried about by wandering cells, and in this way they give rise to fresh centres of growth. Although it may be well understood how the actinomyces increase and multiply inside the animal system, when once introduced, there is some difficulty in ascertaining the mode of infection from without.

As the most common seats of the disease in cattle are the tongue and jaws, this fact seems to point to lesions in this region as being the mode of entrance of the actinomyces; and where the lungs are alone affected probably the minute fungus has been inhaled. And as it has been observed that the fungus prevails on some pastures to an unusual extent, it is natural to suppose that the animals have acquired the disease through grazing on such sharp-pointed grasses as wound the mucous membrane of the mouth, such as the spear grass, and also briars, gorse, etc.

In whatever way the disease is propagated, there should be no hesitation in arriving at the conclusion that all possible endeavours should be made to prevent the spread of the disease to man, and to lessen the risk of infection by the most obvious methods, such as the destruction of infected animals, and the prohibition of the diseased meat from being used as food. Every animal suffering from the disease is a menace not only to its fellows in the same field, but also to the human beings brought into contact with it.

One may compare this disease to leprosy, which is caused by a microscopic bacillus, and which is highly infectious by contact; and as a practical consequence of this infectivity the leper is kept isolated from others.

Mr. Park, when recently in Queensland, made some inquiries as to the extent to which this cancerous disease prevailed there, and ascertained that cases of human Actinomycosis were frequently met with, more especially on those runs where the cattle were similarly affected. It is believed, upon medical authority, that many of the cases of cancer occurring

in Queensland are attributable to the ray-fungus, or in other words are Actinomycosis.

In Queensland, since December of last year, the owners of diseased cattle have been compelled, by regulation of the Public Health Act, to destroy all animals affected with these cancerous diseases; and all animals exposed for sale as food in the market, proved to be diseased, can be seized and destroyed.

On some of the cattle runs it is said that this disease prevails to the extent of about 10 per cent.; and as we obtain some of our meat food from this region, a rigid inspection of all animals arriving by sea is highly necessary.

At Kiama, in N. S. Wales, Mr. Stanley, the Government Veterinarian, at the instance of the Board of Health there, made enquiries into the causes of diseases, tuberculosis and cancer, affecting dairy cattle in that district. In the milking cows he found tuberculosis and Actinomycosis; and tuberculosis in the pigs that were being fed on the milk from those cows which supplied the local butter factory, and which likewise were fed on offal from the slaughteryards.

These facts have been confirmed by Mr. Park, in an examination of portions of the diseased structures taken from these animals given to him by Mr. Stanley. Microscopic slides of these specimens are on the table and can be examined by the microscope, when the actinomyces will be plainly visible.

The presence of actinomyces in these specimens, as well as of the tubercle bacilli, is confirmed by the diagnosis of three medical experts in Sydney, who were called upon to make a microscopic examination of the diseases in question, and who have published their opinions on the subject in the report of the Board of Health of N.S. Wales, dated 9th October, 1890.

The few facts that I have been enabled to bring before the Society this evening show that there is a large field for investigation which has scarcely as yet been entered upon. If the diseases I have been discussing were thoroughly investigated in this colony, and experiments made with a view of testing the extent of the prevalence not only of these, but of other diseases, valuable results would no doubt be shown. And I cannot too strongly urge that this investigation should be made, for, as in the case of tuberculosis and Actinomycosis, other diseases will be found to prevail more extensively than has hitherto been suspected.

A Central Hygienic Institute was recommended by the last Intercolonial Stock Conference, to which all cases of disease amongst animals should be referred from all the colonies. Without some such institution it is not easy to see how

information can be obtained as to the extent these diseases prevail in our midst.

A similar institution should be founded in connection with the Health Department of this colony, as modern science now is not content with mere superficial examination, but proceeds with more strict and reliable methods to detect the micro-organisms, which are undoubtedly the active agents in the production of disease.

I cannot conclude these notes better than by quoting the closing words of Professor Robert Koch in an address before the International Medical Congress held in Berlin, August, 1890, in which he had for the first time clearly foreshadowed the result so far of his researches for the purpose of discovering a method of arresting the development of tuberculosis in the animal system, and had expressed a hope that he was on the eve of complete success in obtaining this grand result. He concludes as follows:—"Allow me, therefore, to conclude this address with the expression of a wish that the nations may measure their strength on this field of labour and in war against the smallest, but the most deadly foes of the human race, and that in this struggle for the weal of all mankind one nation may always strive to surpass the other in the successes which it achieves."