infective diseases as tetanus, erysipelas, pyæmia, and hospital gangrene. This great difference in the records of to-day as compared with those of older and more bloody wars does not depend mainly upon the alteration in the bullet used. That, as we have seen, can do fearful things to a dense obstacle and add to its power for mischief by the laceration caused by bony fragments which it scatters on impact. To some extent the smallness of the canal made by it helps towards recovery. But, above all, the results are due to the treatment of the wounds by the surgeon and the operation of those great principles which have developed under the splendid genius of Lord Lister. He has made possible the unquestionable triumph of conservative treatment. Honoured as he is throughout the whole world, proud as we all are to claim him as a compatriot, his most enduring memorial will be in the multitudes whom he has been the means of saving from pain and death, and in the direction which he has given to scientific surgery for all time.

When the recoveries from wounds in this war are made up and analysed it will be seen what a tremendous progress has been made in protecting the injured from disaster, even in the face of all the difficulties of the battlefield. For, while in the general and stationary hospitals the precautions necessary in modern surgery can be observed, it is, after all, at the initial stage that safety from sepsis is to be secured. "The fate of the wounded rests in the hands of the one who applies the first dressing," wrote Von Nussbaum, and the truth of this assertion has been proved every day. War is at all times full of horrors, but as it is waged to-day it is less terrible than before. In the recent Spanish-American conflict the mortality among the wounded dropped from the 12·96 per cent. of the Civil war to 6·64—a reduction of nearly one-half—a result in part no doubt due to the smaller bullet employed, but more certainly to the improved methods which have been established in the practice of surgery.

Our profession has taken its full share in the work in South Africa, and whether as officers of the Royal Army Medical Corps or as civil surgeons all have worked ceaselessly in ministering to the sick and wounded. They have not flinched in danger on the field and they have vied with their combatant fellows in deeds of valour. Six medical officers have been killed, nine have died from disease, and 12 have been wounded; three civil surgeons have been killed, 11 have died from disease, and five have been wounded. Of all branches, including orderlies and nurses, nearly 400 medical helpers have fallen victims to their labours. It is a noble record of devotion. We must always glory in it, but so also must we delight to know that the true spirit of patriotism is still with us and that so many of our profession have been ready to show, by rendering up their lives, that "A country's a thing men should die for at need."

An Address
ON
TUBERCLE BACILLI IN COWS' MILK AS A POSSIBLE SOURCE OF TUBERCULOUS DISEASE IN MAN.

Delivered at the Fourth General Meeting of the British Congress on Tuberculosis on July 25th,

BY PROFESSOR JOHN MC FADYEAN, M.B. EDIN., M.R.C.V.S.

MR. PRESIDENT, LADIES, AND GENTLEMEN,—As recently as a few days ago, when I was mentally arranging the material for the paper which I have now the great honour of submitting to this Congress, I was under the impression that it would not be necessary to formally prove that the term "tuberculosis" as it is now employed by medical men and veterinary surgeons relates to one and the same disease. I thought that I might ask my audience to accept it as proved and generally admitted that tuberculosis in man is caused by a single definite species of organism—the tubercle bacillus; that this organism is also the cause of the disease to which veterinary surgeons apply the term "tuberculosis" in the case of cattle and other domesticated species; and that therefore there existed a *primâ-facie* case against the germs formed in the bodies of tuberculous animals as a possible source of tuberculous disease in human beings. To-day, however, the position of anyone who undertakes to discuss the intercommunicability of human and bovine tuberculosis is very different from what it would have been a week ago, for in the interval the greatest living authority on tuberculosis—the world-renowned discoverer of the tubercle bacillus and the man to whom we are mainly indebted for our knowledge of the cause of tuberculosis—has declared his conviction that human and bovine tuberculosis are practically two distinct diseases. I do not know how far the reasons assigned by Professor Koch for the opinion which he now holds on this question may have commended themselves to the members of this Congress, and I am overwhelmed at finding myself in a position which compels me to offer some criticism on the pronouncement of one "the latchet of whose shoes I am not worthy to unloose."

That bovine and human tuberculosis were identical diseases was generally supposed to have been finally determined by Professor Koch himself when he discovered that the human and the bovine lesions contained bacilli that were identical in morphological, tinctorial, and cultural characters, and showed that the artificial cultures from both sources produced indistinguishable effects when they were employed to infect a variety of animals. The labours of hundreds of workers during the succeeding 18 years produced nothing in serious conflict with the conclusion that human and bovine tuberculosis were identical diseases, but they brought to light what appeared to be additional evidence of this identity, such as the discovery that tuberculin produced a specific reaction in tuberculous cattle, whether human or bovine bacilli had been employed in its preparation. In short, the identity of the bacilli from the two sources appeared to be as firmly established as any other generally accepted opinion regarding the identity or non-identity of bacteria associated with disease in more than one species of animal. Since it thus appeared to be proved that the only difference between human and bovine tubercle bacilli lay in their accidentally different position—one being parasitic in man and the other in cattle—it was natural to conclude that when circumstances were favourable for the transference of bacilli from one species to the other human tuberculosis might have an animal origin, and *vice versâ*.

Opinions varied as to the frequency with which this transmission of tuberculosis from one species to the other occurred, but practically never within the last 18 years regarding the possibility and probability of such reciprocal infection. What are the grounds upon which we are asked to discard convictions that appeared to rest on such a solid basis? I shall endeavour to state them briefly, as I understand Professor Koch's train of reasoning. 1. The bacilli found in cases of bovine tuberculosis are much more virulent for cattle and other domestic quadrupeds than the bacilli found in cases of human tuberculosis. 2. This difference is so marked and so constant that it may be relied upon as a means of distinguishing the bacilli of bovine tuberculosis from those of the human disease, even assuming that the former may occasionally be found as a cause of disease in man. 3. If bovine bacilli are capable of causing disease in man there are abundant opportunities for the transference of the bacilli from the one species to the other, and cases of primary intestinal tuberculosis from the consumption of tuberculous milk ought to be of common occurrence. But post-mortem examination of human beings proves that cases of primary intestinal tuberculosis are extremely rare in man, and therefore it must be concluded that the human subject is immune against infection with the bovine bacilli, or is so slightly susceptible that it is not necessary to take any steps to counteract the risk of infection in this way.

Now, with the utmost diffidence I venture to submit that at least one of the premisses contained in this argument is not well founded, that the others have little or no bearing on the question, and that there still remain reasonable grounds for regarding tuberculous cow's milk as distinctly dangerous to human beings.

It cannot be denied that what may be called bovine tubercle bacilli are as a rule distinctly more virulent for cattle and other domesticated animals than are human bacilli or that the results of experiments indicate that in natural circumstances there is little danger of cattle becoming infected from human beings. But it cannot be admitted that the low virulence of human bacilli for cattle proves, or even makes it probable, that bovine bacilli have only a feeble pathogenic power for

man. That might have been held to be probable if it had been shown that bovine bacilli were very virulent only for cattle, but since it is well established that these bacilli are highly dangerous for such diverse species as the rabbit, horse, dog, pig, and sheep, and, in short, for almost every quadruped on which they have been tried, it appears to be highly probable that they are dangerous to man. At any rate, it is impossible to cite any ascertained fact relating to other bacterial diseases that makes the contrary conclusion probable. It is well known that the majority of the disease-exciting bacteria are harmful to only one or two species, but all those that are common to all the domesticated animals are also pathogenic to man.

With regard to the view that the difference between human and bovine bacilli in respect of virulence for cattle is of such a fixed and constant character that it may be relied upon to distinguish the one from the other it need only be said that that is very far from being proved. It appears to be quite possible that what may be called the normal or average virulence of bovine bacilli for cattle may be reduced by passage through the human subject. Besides there are very great differences in the virulence of tubercle bacilli found in animals of the same species and if a low degree of virulence for cattle is to be taken as the distinguishing feature of human bacilli there will be no difficulty in proving that the human disease is sometimes transmitted to the lower animals.

The third proposition in Professor Koch's argument is the only one which is really germane to the point at issue—viz., that only cases of primary intestinal tuberculosis can possibly have had their origin in infected milk or meat and that "such cases are extremely rare." Professor Koch refers to several large series of post-mortem observations that appear to justify this statement and adds that he could have cited many more pointing to the same conclusion. Now, if it were a fact that all the statistics relating to this point were unanimous it would have to be admitted that primary intestinal tuberculosis is rare in the human subject, and that cases of infection through milk are still rarer, though even then it might be advisable to take measures to prevent the few cases. But the statistics are not by any means unanimous, and those that are likely to appeal with most force to the people in this country are not at all in accord with those quoted from Germany. During the last few years the evidence obtainable from the post-mortem records of two of the largest hospitals for children in this country have been analysed with great care in order to see what evidence they afforded as to the relative frequency of the different methods of infection in tuberculosis. In the case of the Hospital for Sick Children in Great Ormond-street this has been done by Dr. G. F. Still and in the case of the Royal Hospital for Sick Children in Edinburgh by Dr. T. Shennan. The conclusion at which Dr. Still arrived was that in 29·1 per cent. of the cases of tuberculosis in children primary infection appeared to have taken place through the intestine. That is very far from being an insignificant proportion, and it is a striking fact that Dr. Shennan arrived at an almost identical conclusion and estimated that 28·1 per cent. of the cases of tuberculosis among children in Edinburgh were due to alimentary infection. There does not appear to be any ground for supposing that there is a large margin of error in these statistics, as the number of cases dealt with was considerable (547 in the two series), and in both series the post-mortem appearances were interpreted in a way to which no exception can be taken. In face of these statistics it is not possible to assent to the statement that cases of primary tuberculosis of the alimentary canal are extremely rare. Precisely the contrary conclusion is the one that must in the meanwhile be drawn with regard to the state of affairs in this country—viz., that, at least in children, primary infection by way of the alimentary canal is comparatively common. I therefore submit that there is still a strong *primâ facie* case against animal tuberculosis as a possible source of human tuberculosis, and it becomes necessary to consider whether there are any data from which one may estimate the extent of the danger to which human beings are exposed through the occurrence of tubercle bacilli in milk.

The evidence in favour of the view that the ingestion of tuberculous milk is one of the causes of human tuberculosis includes a number of recorded cases in which the relationship of cause and effect appeared to be obvious. From the nature of the circumstances evidence of this kind is very scanty, and it must be admitted that very few of the alleged examples are absolutely convincing. Tuberculosis is a disease that develops slowly and, assuming for the moment that tubercle bacilli do occur in milk and are a cause of disease in persons consuming such milk, it is obvious that, as a rule, the very act by which the infection is brought about destroys the only direct evidence of cause and effect that exists. One could only expect to be able to trace the disease to the milk when, after the onset of symptoms pointing to infection by way of the mouth, the cow from which the milk had been obtained was still available for examination. In practice this is rarely the case, and it is therefore not surprising that medical literature contains very few specific instances of the infection of human beings with tuberculosis by means of milk. It is obvious, however, that the entire absence of evidence of this kind would in no way exonerate milk from the suspicion of being one of the causes of human tuberculosis.

We have already seen that, at least in this country, in a considerable number of cases of tuberculosis occurring in early life, the first seeds of the disease appear to have entered into the body by way of the mouth. What proportion of these cases ought to be ascribed to tubercle-infected milk? It scarcely appears to be possible to give a very confident reply to this question, though some distinguished authorities have not hesitated to express the opinion that practically all the cases of primary intestinal tuberculosis occurring in childhood may be set down to this cause. The late Sir Richard Thorne, in the Harben Lectures on the Administrative Control of Tuberculosis which he delivered in 1898, expressed his conviction that tuberculous milk was the main cause of tabes mesenterica in children, and he characterised the loss of child life from this cause as appalling. The evidence on which this formidable charge was laid against the milch cow was of the following nature. The Registrar-General's returns show that during the last 50 years there has been a marked decline in the death-rate from human phthisis, which is the form that tuberculosis generally takes when the bacilli are inhaled. On the other hand, during the same period there has been only a slight decline in the death-rate at all ages from that form of tuberculosis which is ascribable to alimentary infection, and among children under one year of age there has been a notable increase in the mortality from that form of the disease. The decline in the death-rate from phthisis is ascribable to the great improvements which have been effected during the last 50 years in the hygiene of human habitations, such as improvements in lighting, drainage, and ventilation. These, naturally, have not interfered with infection through milk, which has therefore remained unchecked and in infants has even increased, because during the last 50 years cows' milk has entered more largely into the dietary of very young children.

There are several weak points in this argument. Perhaps the weakest of all is the assumption that the deaths certified under the head of "tabes mesenterica" correspond closely with those which the pathologist would classify as cases of primary alimentary infection. It is scarcely possible to doubt that the term "tabes mesenterica" in the Registrar-General's return covers a heterogeneous collection of cases of which the majority may not be cases of tuberculosis at all. But even if it is agreed to accept all the cases registered under the head of "tabes mesenterica" as instances of primary alimentary infection, the figures found in the Registrar-General's returns do not support the contention that milk is responsible for all the cases of tabes. It is true that they indicate an increase in the death-rate from alimentary tuberculosis among children under 12 months old, but, on the other hand, there appears to have been a considerable decline in the death-rate from the same cause at all ages between one and five years. Now, if tuberculous milk were a frequent cause of tuberculosis, one would not have expected the death-rate from that cause to decline among children between one and five years of age, for there is no reason to suppose that there has been any decline in the use of cows' milk in the feeding of children at that age during the last 50 years. The fact appears to be that the Registrar-General's returns do not afford much trustworthy information with regard to the number of cases of primary alimentary tuberculosis and are absolutely worthless as an indication of the extent to which human beings are infected by means of milk.

There is another direction in which one may turn for evidence on this point. We cannot with any pretence to accuracy ascertain the number of persons who annually become infected by milk, but we may be able to form some

estimate of the existing danger in this connexion by collecting information as to the frequency with which milk contains tubercle bacilli. We know that about 30 per cent. of all the cows giving milk in this country are tuberculous in some degree. This statement, no doubt, indicates a deplorable state of affairs, but in the present connexion it is not quite so alarming as it at first sight appears. Fortunately, not every cow that is tuberculous gives milk containing tubercle bacilli. It is true that opinions with regard to this point are not absolutely unanimous, but there is ample evidence to justify the assertion that, as a rule, the milk is not dangerous until the udder itself becomes diseased. The experiments pointing to an opposite conclusion form only a small minority, and the results obtained in most of them were probably due to carelessness on the part of the experimenter. In a few of the cases in which the milk of an apparently healthy udder was found to be infective it is probable that the gland tissue was in reality diseased, though not to an extent discoverable without microscopic examination. The important question, therefore, is not what proportion of milch cows are tuberculous, but what proportion of them have tuberculous udders. Some authorities have estimated this to be as high as 10 per cent., but the proportion is certainly much less than that in Great Britain. My own experience leads me to think that about 2 per cent. of the cows in the milking herds in this country are thus affected. Now, the milk secreted by a tuberculous udder always contains tubercle bacilli, and it sometimes contains enormous numbers of them, and when these facts are apprehended one begins to realise the seriousness of the danger to which, in the present state of affairs, those who drink uncooked milk are exposed. But there are one or two considerations that make the danger greater than the mere statement of the number of cows affected would at first sight indicate. In the first place, the udder disease is not attended by any pain or tenderness in milking, and the milk for a considerable time after the udder has become manifestly diseased may appear quite wholesome, though in reality it is charged with the germs of tuberculosis. It therefore often happens that the gravity of the condition is not realised by the milker or the owner of the cow, and the milk continues to be sold for human consumption. There is scarcely any room for doubt that if it were sold and consumed unmixed with other milk some of the persons partaking of it would become infected. In practice it is usually mixed with the milk from other cows that have healthy udders and thus the germs are distributed among a larger number of persons. Even tuberculous milk that has been thus much diluted may prove infective, but the danger to the individual consumer is in inverse proportion to the degree of dilution. Since about one cow in 50 is the subject of tuberculosis of the udder, and the average number of cows in the milking herds of this country is less than 50, it follows that the majority of dairies and farms supply milk that is free from tubercle bacilli, or at least does not contain any derived from this source. On the other hand, when the infected material is present, it operates with the greatest intensity in the milk of single cows and in the mixed milk from small herds

It must be added that tuberculous disease of the udder is not the only source of tubercle bacilli found in milk. A great deal of the milk in the market contains a considerable quantity of dust and dirt, most of which comes from the cow's udder and the hands of the milker, and part from the dust of the air of the cowshed. When 30 per cent. of the cows in a byre are tuberculous the dirt in that building and the atmosphere in it are almost certain to contain tubercle bacilli, and some of these are very likely to find their way into the milk. The more dirt milk contains the greater is the chance that tubercle bacilli from that source may be present.

What has been said with regard to the extent of the danger to which the public are exposed through the sale of milk containing tubercle bacilli may be summed up as follows. The danger cannot be defined by stating how many persons are thus infected annually, or what fraction the persons thus infected form of the total number who contract tuberculosis in the course of a year. At the same time, it is impossible to doubt that the danger is a very real one, since at the present time milk is a vehicle by which tubercle bacilli are often introduced into the bodies of human beings.

As to the means of averting the danger, the ideal method of counteracting this source of human disease would be to stamp out bovine tuberculosis or to prevent the sale of milk from every cow that is tuberculous. Unfortunately, it must be admitted that at present that is unattainable. At the present time probably not less than 30 per cent. of all the breeding and milking cattle in this country are in some degree affected with tuberculosis, and to urge that the disease should be attacked on the lines adopted in dealing with cattle-plague and pleuro-pneumonia is an effectual method of preventing any Government from touching the subject. But although the complete and rapid extermination of the disease is impossible it does not follow that nothing can be done, or ought to be done, in the way of prevention. The disease has attained to its present alarming proportions simply because, until quite recently, altogether erroneous notions were held regarding its cause, and because there has hitherto been the most absolute neglect of the precautions necessary for its prevention. The greatest obstacle to successful action against tuberculosis, whether in man or animals, is the ignorance of the laity regarding the cause of the disease. The immense majority of cattle-owners are not yet convinced that contagion is the only cause of tuberculosis, and very few of them have yet made the slightest effort to check the spread of the disease. As a rule, cows and other cattle visibly ill from tuberculosis are still left alive and in close association with their fellows, although the lowest grade of common sense and prudence would suggest that such animals ought to be promptly killed or at least isolated. It is not want of common sense, nor is it mainly lack of means, that is responsible for this reaction—it is simply a want of conviction on the part of cattle-owners that tuberculous animals are dangerous to their companions.

The first thing necessary in this connexion is education of the people regarding the nature of the disease. This is necessary, because in this country, where Parliament never moves except by the force of public opinion, the legislative action required will not be taken unless the people are satisfied of its wisdom and also because even the most drastic sanitary measures enforced by the law are likely to fail if they are not supplemented by the intelligent coöperation of the people The National Association for the Prevention of Consumption and other Forms of Tuberculosis and the Royal Agricultural Society have been endeavouring to disseminate sound views regarding the cause of bovine tuberculosis among farmers and others, but much remains to be done in this direction. But it is not reasonable to ask that things should be left as they are until the education of the farmer in the matter of tuberculosis has been finished. If there are any practicable and reasonable measures by which, figuratively speaking, the flow of tubercle bacilli from tuberculous cows to healthy human beings can be stopped or impeded, they ought to be immediately enforced.

As soon as the valuable diagnostic properties of tuberculin had been proved by experience it occurred to a good many people that its assistance ought to be called in in order to exclude tuberculous cows from milking herds. In other words, it was thought that although it might not be practicable to insist upon the application of the tuberculin test to all infected herds and to compel the isolation or slaughter of all cattle thus found to be infected, it might still be possible to require that only cows found to be free from the disease by the application of the test should be kept for milch purposes. I doubt whether anyone who is well acquainted with the circumstances of the case now believes this to be practicable. Here, again, the fact that one-third of the cows now giving milk are tuberculous is an insurmountable obstacle. The cost of carrying out the tuberculin test several times annually in all the milking herds in this country would be enormous, and the exclusion of all reacting cows from such herds would seriously disorganise cattle-breeding as well as milk production. Moreover, to rely blindly on the tuberculin test, and to pronounce the milk of every cow that does not react to it free from tubercle bacilli, would be very unsafe. The test is recognised to be one of great value, but it is not infallible. Rather serious defects in connexion with it are: (1) that for a period after infection—a period that is sometimes very considerable—an animal will not react; (2) that in some advanced cases of tuberculosis no distinct reaction is obtainable; and (3) that in a considerable proportion of cases a second reaction is not obtainable for some days or weeks after the first. It is therefore clear that if we wish to exclude the milk of tuberculous cows, or if the object is the more restricted one of preventing the sale of milk from tuberculous udders, some system of inspection is necessary.

This was the conclusion at which the second Royal Commission on Tuberculosis arrived. We have already seen that whatever danger attaches to milk comes mainly from cows with tuberculosis of the udder, and the public health would be almost entirely safeguarded from this danger if we could exclude such animals from our dairies. Periodical examination by competent inspectors would go a long way towards securing this object, but the inspection would require to be at rather short intervals, for tuberculosis of the udder may come into existence and attain most dangerous dimensions in a period of a few weeks. The more frequent the inspection the better, but of course this means a great deal of expense. If every town and rural district produced its own milk it would be a comparatively simple problem to organise and carry out a fairly efficient system of inspection of milch cows, but as the law at present stands the majority of the population cannot obtain this safeguard. With the exception of Glasgow, Manchester, and a few other places, a local authority has no power to inspect cows outside its own district, and the helpless position in which this state of the law leaves the inhabitants of London and other large towns is obvious. If cows of which the milk is sold for human food had everywhere to be submitted to periodical inspection such inspection would naturally be undertaken by the various local authorities, each of which would supervise the cows and cowsheds in its own district; but the compulsory inspection of all the milch cows in the country would be a very large undertaking, and perhaps it would be premature to press for it. In the meantime a good case can be made out for making general the special powers relating to inspection of cows in outside districts which a few fortunate cities have acquired by special Acts of Parliament. This also was one of the directions in which the members of the second Royal Commission on Tuberculosis considered immediate action to be necessary.

There remain for consideration some other safeguards which would doubtless be less effective than those just discussed, but which, unlike these, would not be difficult to enforce—viz.: (1) compulsory notification of udder disease and of any symptoms of tuberculosis in milch cows, with, of course, the power to inflict a considerable fine for not reporting; and (2) the interdiction of the sale of milk from any cow suffering from tuberculous disease of the udder or exhibiting clinical signs of tuberculosis. Against the demand for the amendment of the existing law to the extent of granting the public these very reasonable safeguards against infection through milk it cannot be urged that they would be very expensive or that they would press harshly on private interests. The present state of the law, or rather the almost entire absence of any law, dealing with tuberculous disease of the udder in cows is a scandal and a reproach to civilisation. It scarcely sounds credible, but it is a fact, that the owner of a cow in the most advanced state of tuberculosis, and exhibiting the most manifest signs of udder disease, may sell that cow's milk for human food as long as the sale has not been specially interdicted on the certificate of a veterinary surgeon, and that no penalty attaches to this crime of deliberately or carelessly placing on the market a food material charged with the germs of a dangerous disease. In the interests of public health the sale of milk from tuberculous udders and from cows that are obviously tuberculous in any part of the body must be stopped, and it must be declared illegal to keep such animals alive. There need be no hesitation in pressing for this reform because the measures demanded are in the interests of the owners of cattle and would be advisable even if it were established that bovine tuberculosis is not transmissible to man. There is no dispute as to the danger of visibly tuberculous animals to others of their own species, and it is the very reverse of a hardship to the owner of such animals to insist on their being slaughtered.

It would probably be regarded as a serious omission if I did not refer to one other method of counteracting whatever danger at present attaches to impure milk as a cause of tuberculosis. No matter how highly charged milk may be with tubercle bacilli, it can be deprived of all danger from that source by raising it to the temperature known to be fatal to these germs. Less than the boiling temperature (212° F.) suffices for this purpose; but, unfortunately, the lowest temperature that can be relied upon imparts to the milk a flavour that many people find distasteful. That objection does not hold good in the case of infants and young children, and the custom of boiling or steaming the nursery milk for a few minutes cannot be made too general. But while abstinence from uncooked milk is a sure way of avoiding infection with bacilli present in that article of food, it cannot for a moment be admitted that this absolves public health authorities from all concern with the subject. Arsenical beer may be made harmless by adding the proper antidote before drinking it, but the most courageous brewer would not plead this as an excuse for selling the impure article.

In conclusion, I would venture to express the earnest hope that the Congress will not endorse the view that it is inadvisable to take any measures to prevent the transmission of tuberculosis from the lower animals to human beings. To justify the introduction of measures to that end it is not necessary to contend that this is a common method of infection, or that the danger arising from milk can for a moment be compared with that present in human sputum. The inhalation of tubercle bacilli expelled from the bodies of human patients is doubtless the great cause of human tuberculosis, and every practicable means of preventing infection in that way ought to be employed; but at the same time we ought not to concede to the milkmen the right to sell us tubercle bacilli, even if we were assured that—like Professor Koch's experimental pigs—we had nothing to fear beyond the development of "little nodules here and there in the lymphatic glands" of our necks and "a few grey tubercles" in our lungs.

WHAT ADMINISTRATIVE MEASURES ARE NECESSARY FOR PREVENTING THE SALE TO THE PUBLIC OF TUBERCULOUS MEAT?[1]

BY SHIRLEY F. MURPHY, M.R.C.S. ENG., L.S.A.,
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WHEN I was asked to open a discussion at this Congress on the administrative measures which are necessary for preventing the sale to the public of tuberculous meat it was at once obvious to me that no new material, no new fact, could be submitted to the meeting. The measures which are necessary are well understood by those who have directed their attention to the subject and what is wanted now is not the knowledge by such persons of what to do but the education of the public in the necessity for adopting in this country measures which have been tried and found successful elsewhere. In England we are always slow to modify our procedure and in any matter which is held to affect a trade interest especially slow, for this interest at once provides an opposing force which renders the education of the public difficult. This force is able to manifest its power from the beginning and at a time when the public concern themselves little with the subject. It is only at a later stage that the public find that they have an interest at stake and that they must bestir themselves to put law makers and law administrators in motion. When once this position is arrived at we may look forward to success. Our Congress may do much by discussion of this subject to create a wider interest in it and by influencing public opinion to bring about the result which is hoped for by those who see the need for better supervision over meat-supplies.

It is not within our province in this section to consider whether or not the consumption of the meat of tuberculous animals is prejudicial to man. The title of the subject which I am invited to discuss implies that tuberculous meat must be excluded from the food-supply. This question has been considered by two Royal Commissions, the second of which was presided over by our chairman, Sir Herbert Maxwell. I shall later have to mention the conclusion at which this Commission arrived, and this because it has a necessary bearing upon the sort of administration which is needed, but I shall accept its conclusions and shall not enter into a discussion of pathological questions. I may, however, in commencement, briefly refer to the frequency with which tuberculous diseases affect cattle and the proportion of those which are slaughtered which must be deemed to be unfit for human food. If animals were rarely affected with this

[1] A paper communicated to the British Congress on Tuberculosis. Section I., State and Municipal.