

Cattle tuberculosis and tuberculous meat / by Henry Behrend.

Contributors

Behrend Henry.
Royal College of Physicians of Edinburgh

Publication/Creation

London : F. Calder-Turner, 1893.

Persistent URL

<https://wellcomecollection.org/works/nmanc2xb>

Provider

Royal College of Physicians Edinburgh

License and attribution

This material has been provided by This material has been provided by the Royal College of Physicians of Edinburgh. The original may be consulted at the Royal College of Physicians of Edinburgh. where the originals may be consulted.

This work has been identified as being free of known restrictions under copyright law, including all related and neighbouring rights and is being made available under the Creative Commons, Public Domain Mark.

You can copy, modify, distribute and perform the work, even for commercial purposes, without asking permission.



Wellcome Collection
183 Euston Road
London NW1 2BE UK
T +44 (0)20 7611 8722
E library@wellcomecollection.org
<https://wellcomecollection.org>

CATTLE TUBERCULOSIS
AND
TUBERCULOUS MEAT.

*^u Hab. 43

R36176

with the Author's compliments.

THE UNIVERSITY OF CHICAGO

PHYSICS DEPARTMENT

1917-1918

PHYSICS DEPARTMENT

PHYSICS DEPARTMENT

PHYSICS DEPARTMENT

PHYSICS DEPARTMENT

PHYSICS DEPARTMENT

PHYSICS DEPARTMENT

PHYSICS DEPARTMENT

PHYSICS DEPARTMENT

PHYSICS DEPARTMENT

PHYSICS DEPARTMENT

PHYSICS DEPARTMENT

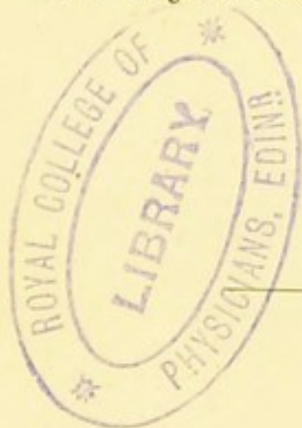
PHYSICS DEPARTMENT

CATTLE TUBERCULOSIS
AND
TUBERCULOUS MEAT.

BY

HENRY BEHREND,

*Member of the Royal College of Physicians of Edinburgh,
the Royal College of Surgeons of England,
&c. &c.*



LONDON:

F. CALDER-TURNER, 1, BATHURST STREET,

HYDE PARK GARDENS, W.

1893.

LONDON:
PRINTED BY MORTON AND BURT,
187, EDGWARE ROAD, W.

P R E F A C E .

THE first and second of these papers appeared in the "Nineteenth Century" of September, 1889, and October, 1890, respectively, and are now reprinted by permission. The third, which has not hitherto been published, brings the knowledge of the subject to the present date. I am induced to collect them together in consequence of the numerous enquiries I receive as to where they are to be found, and of the increasing importance of the question which is occupying the attention of a Royal Commission, and is one of the chief features of the Earl of Winchilsea's proposed Agricultural Union.

NORFOLK CRESCENT, W.

February, 1893.



Digitized by the Internet Archive
in 2015

<https://archive.org/details/b21697838>

CATTLE TUBERCULOSIS AND TUBERCULOUS MEAT.

I.

No more important contribution has been made to science in recent years than that embodied in a report by Dr. Koch, the Government adviser in the Imperial Health Department of Berlin, in March, 1882, on the *Etiology of Tubercular Disease, and the Life-history of the Tubercle-Bacillus*. Long before his investigations the communicability of this—the most deadly of all the maladies which afflict humanity—had been placed beyond doubt; but it was reserved for him to demonstrate the precise character of the contagium, and to discover by microscopic examination of diseased organs of men and animals the existence of the minute parasitic organism dwelling in the centre of the tubercle-cell. Transferring the tuberculous matter from affected to healthy animals, he invariably reproduced the disease; and by artificial cultivation of the bacillus through many generations (to ensure its purity and eliminate any other virus), and its subsequent introduction into the circulation of healthy

animals, resulting in every case in the reproduction of the parasite and the appearance of the tuberculous condition, he proved beyond the possibility of doubt that it was the bacillus solely, and not any virus in which it was embedded in the diseased organs, that was the *fons et origo mali*. Koch's experiments, repeatedly verified by physiologists in all countries, have laid the foundations of a much more intelligent and practical pathology of tuberculosis, and have opened up questions of immense importance to all in their bearing upon public health. It is to the consideration of one of these—the transmission of tuberculosis to man from cattle by alimentation—that I desire to call attention in the following pages.

Prior to the announcement of Koch's discovery, I had written several papers upon this subject, epitomising the facts as established by scientific investigation up to that period. The re-issue of these articles as a pamphlet by several societies interested in the question, their translation into various languages, and their republication in many journals at home and abroad, have given them an amount of publicity, which has brought upon me a mass of correspondence as to the progress of the inquiry, and has convinced me that its solution is awaited with considerable interest. I propose, therefore, to give a concise report of the present state of our knowledge of the subject; whose study is now attracting an amount of attention commensurate with its im-

portance, and has established a number of facts of the greatest value in connection with the physical well-being of mankind.

The conclusions arrived at in my earlier papers may be summarised as tending to show that many diseases, common to man and the lower animals, are communicable from one to the other, not merely by actual transference, as in the parasitic class, but also by alimentation, and that the flesh of affected cattle is not only deprived of most of its nutritive qualities, but is capable of communicating its specific malady to man when taken as food. Putting aside many forms of disease, of which this holds true, from their comparative rarity (though that these are by no means unworthy of notice is shown by the fact that from one alone, anthrax, no less than 528 human beings perished in Russia from 1867 to 1870), the chief interest of the inquiry centres in the communicability of the tuberculous class of diseases, and especially of consumption; because not only is this the most fatal to which mankind is liable, but also because, though it has been up to a very recent period a matter of doubt whether the malady, as existing in cattle, is identical with that of man, this question has now been solved in the affirmative, and the evidence in favour of its communicability from one to the other is overwhelming. To prove, if proof be needed, that the importance of this class of diseases is not overrated, I may adduce the facts that it is accountable for one-fifth

of the entire mortality of this country ; and that out of 50,825 deaths which occurred in Paris during the year 1888, 11,592—nearly one-fourth—were ascribed to tuberculous maladies.

The prevalence of tubercle in cattle is remarkable, and its danger is intensified by the fact that it is frequently incapable of being recognised during lifetime, and is revealed only by a post-mortem examination of the organs implicated. Such flesh is freely exposed for sale in this and almost every other country. ‘Tuberculous cattle are known in the trade as “mincers” and “wasters,” and in the most marked stage of the disease are sold in quarters of towns where inspection is escaped ;’¹ and Dr. Carpenter states that an inspector in the Metropolitan Meat Market declared upon oath that 80 per cent. of the meat sent to the London market had tubercular disease. The *Glasgow Herald*, which has lately devoted special attention to the subject, arrives at results equally startling, based on official reports, the markets in that city being flooded with tuberculous cattle for consumption as food.

“And it is to be hoped,” says the *British Medical Journal*,² “that the mass of evidence, collected as to the nature of the poison of tuberculosis, and the terrible danger to the community from its dissemination, will lead to a complete revolution in the mode of conducting business in the Glasgow dead meat market, and prevent

¹ *Lancet*, July 2, 1888. ² April 27, 1889.

the poorer classes being fed any longer on meat described by a butcher as 'possibly a shade above carrion, but very little.' "

To such a degree, indeed, does this practice prevail there, that the Sanitary Department of the city has taken steps to test in the law courts the question of its power to order the destruction of all carcasses of animals found to be affected by pulmonary tuberculosis, whether other organs besides the lungs are affected or not. The case was raised by the seizure by the Sanitary Inspector, acting under the 26th section of the Public Health Act, on the 8th of May, of the carcasses of a bullock and a cow affected with tuberculosis. Hitherto the practice of the meat inspectors has been to cut out any diseased portions, and to pass as fit for food all parts which appeared healthy, and the question which now arose for decision was whether the flesh of an animal could be consumed without risk when tuberculosis was limited to one or more organs—the lungs, for example—the affected parts being removed. The local authority, asserting the risk to be sufficient for the condemnation of the entire carcass, was supported by a number of skilled witnesses, in accordance with the report of the Departmental Committee of the Privy Council and of the International Veterinary Congress of Paris of 1888. Dr. Russell, the medical officer of health for Glasgow, stated that 17 to 18 per cent. of the total deaths in that city were due to tuberculosis, and the tubercle-bacillus

was found in both carcasses; and evidence was adduced that since 1874 all such animals had been condemned as unfit for food in Greenock and Paisley, however limited the extent of the disease. Sheriff-Principal Berry has, after mature consideration, issued his decision that the animals in question were unfit for human food, and should be destroyed; and the grounds of his judgment—one that may have very important and widespread results—are, that it has been proved that tuberculosis was transmissible from animals to man by ingestion, and that though the flesh was to all appearance healthy after the removal of the diseased parts, yet the possibility of tubercle having extended further than was apparent was sufficient to justify its condemnation.

“There may be no appearance visible to the naked eye of the action of the bacillus in a particular part of the animal, and yet it may not improbably be there. The presence of the agent of the disease must precede the visible results of its action; indeed, the present case affords an illustration of the danger of inferring, from the absence of symptoms visible to the unaided eye, that the disease is localised.”

And, in concluding his judgment, the sheriff said that, while deeply sensible of the responsibility of condemning as unfit for food, meat which has hitherto been freely allowed throughout the country to pass into consumption, he was nevertheless of opinion that this consideration must be overridden in the interest of the

public health—which is of paramount importance. An appeal to the Court of Session has been lodged against the decision by the representatives of the trades whose interests are involved—and this still awaits hearing.

A similar condition of affairs exists on the Continent. Dr. Richter stated recently, at a meeting of the Berlin Medical Society, that the prevalence of tuberculosis in cattle is much greater than most people suspect, and that he had been informed by veterinary surgeons that, in some localities in Germany as many as fifty per cent. are affected; that the animals may show no signs of the disease during life, and no means of accurately diagnosing it are at present known; and that, consequently, its presence is often only revealed by examination after death. In Denmark its extreme frequency has been repeatedly demonstrated, yet we import cattle thence into this country for food to the annual value of five millions sterling. At the Congress on Tuberculosis held in Paris in July, 1888, special attention was directed to the subject. Many leading medical authorities dilated on the grave yet unsuspected danger to the public. M. Nocard, quoting the high authority of the late M. Bouley, urged that, if an animal presented signs of tubercle in any organ, howsoever localised, it should at once be rejected as unfit for food; and M. Toussaint declared that a large proportion of the cattle sent to the *abattoirs* in France suffer from the malady, and that its presence has hitherto not been considered sufficient

to disqualify them for sale in the markets. The only town, as far as I know, in which a systematic inspection of all dead meat is enforced is Hanover, and my authority is the late Mr. Jenkins, secretary to the Royal Agricultural Society, who stated, in a letter to the *Times*, that none is allowed to be sold there unless it is stamped by the official inspectors ; and before the stamp is affixed a careful examination of the various organs is made by experts continuously employed for the purpose. In the month preceding Mr. Jenkins' visit, about 8,000 pounds' weight of meat was condemned as tuberculous, and he adds : ' It is well known that this fatal disease can be communicated by meat taken as food ;' and ' there is no control in London of the nature of that which I have indicated as existing in the markets of Hanover. I do not know to what extent the "kosher" meat of the Jews is examined, and the number of cattle consumed in London which are thus affected can only be guessed at : some salesmen have expressed their conviction that it is very large. But, if we apply the Hanoverian standard, we shall find that 7,500 head of cattle thus affected are eaten by Londoners every year, and that, at the ordinary rate of computation, at least 375,000 of the inhabitants of the metropolis run the risk of being tainted with consumption, and transmitting it to their unborn children. To this huge danger must be added the scarcely smaller (if, indeed, not greater) one, of this fatal disease being communicated by dead meat imported

into London both from country districts and from foreign lands.' Mr. Jenkins concludes that 'as tuberculosis cannot be detected during the life of the animal, unless almost at its last gasp, the magnitude of the evil seems to call for a complete investigation, with a view to the establishment of an early and compulsory control.'

As regards the results of examination according to the Jewish method, the most recent returns show that, during a period of six months, of 13,116 oxen slaughtered in London, only 6,973 were passed as coming up to the admissible standard; and taking the average of the last five half-years, 40 per cent. of the oxen, 29 per cent. of the calves, and 23 per cent. of the sheep were rejected.

That the New World fares no better than the old in this respect is shown by the report on the prevention of tuberculosis made to the Board of Health of the city of New York, by the Pathologists of the Health Department,³ who affirm that 'it is a distinctly preventable disease;' that it may be, and is, transmitted by the milk and flesh of affected animals; 'and that those measures of precaution alone answer the requirements which embrace the governmental inspection of dairy cows and of animals slaughtered for food, and the destruction of all those found to be tuberculous.' And at the recent International Medical Congress held at Melbourne, Dr.

³ *New York Medical Record*, xxxv. 643.

MacLaurin, the President of the New South Wales Board of Health, gave some noticeable figures tending to support the conclusion that the use of meat from tuberculous cattle constitutes a very real source of danger, and is the cause of much of the great mortality from phthisis in the colony. The evidence taken before a Commission in Victoria showed the great prevalence of tubercle in stock in Australia, and Dr. MacLaurin, describing the precautions taken in the selection of animals free from blemish by the Jews, adduced the remarkable fact, that among the Jewish population of New South Wales, numbering 4,000, and dwelling mostly in the towns, but one death from consumption had occurred in three years, whereas if the disease had been as prevalent among them as in the rest of the population, thirteen or fourteen would have succumbed.

The next link in the chain of evidence is as to the *identity* of *human* and *bovine tuberculosis*, which was for long undetermined, but has now been definitely solved in the affirmative. An elaborate essay by Dr. Creighton on 'Bovine Tuberculosis in Man' has afforded convincing proof, not only of this, but also of its communicability from the one to the other. And Dr. Parkes, assistant to the Professor of Hygiene in University College, London, has shown⁴ 'that the bacilli of bovine tuberculosis are identical—according to all bacteriological methods at present known—with those

⁴ *British Medical Journal*, April 21, 1888.

found in tubercular formations in the organs of man. In the statement previously quoted, Dr. Richter affirms that there can no longer be any doubt as to the identity of the two; and M. Chauveau, the President of the Paris Congress on Tuberculosis in 1888, reported that the experiments carried out in the Veterinary School of Lyons to determine the point have fully established their absolute identity. In two lectures devoted to the consideration of the subject, Dr. Woodhead, superintendent of the laboratory of the Edinburgh Royal College of Physicians, gave it as the result of his observations that the bacillus of tubercle in man and the lower animals was identical, and that this point may now be regarded as finally settled.

Evidence as to the *communicability of tuberculosis to man from the flesh of affected cattle* has been freely forthcoming since my earlier papers: the subject is engaging the attention of pathologists in almost every country, and the results of their investigations yield abundant testimony to the development of the malady—or the predisposition to it—from this source. Dr. Parkes, in the lecture already noticed, states that it may be fairly assumed that in many cases of tubercle in the human subject the virus has been introduced with the food, and its absorption has taken place through some portion of the digestive tract, the incidence of the malady in these organs being especially marked in children. In a weighty address ‘On the relation of Minute Or-

ganisms to certain specific Diseases,' Dr. Klebs, Professor of Pathological Anatomy in the University of Prague, summarises our knowledge in the assertion that 'the conclusion which appears to me to follow inevitably from this survey of the results of modern investigation is this: that specific communicable diseases are produced by specific organisms.' Dr. Woodhead, in the lectures delivered by him as Sanitary Scholar of the Grocers' Company in 1888, said that all cases of rapid infective phthisis are the result of the action of the bacillus, the differences observed being due to the resisting power of the tissues involved, and the number and activity of the attacking bacilli. These, as shown by the researches of Weigert, Ponfick, and Coats, pass into the general circulation of the blood, in which they are frequently found, and thence into the organs of the body where the tuberculous changes occur. Dr. Woodhead expressed his concurrence in the view that the flesh and milk of affected animals convey the bacillus, and that its effects would depend entirely upon the resisting power of the tissues and the general health of the individual: in weakly persons, especially in children with their imperfect nutritive power, the tissues are apt to give way on the slightest stimulation, and if their vitality be low, the introduction of even a small number of bacilli suffices to produce scrofulous degeneration of the glands, upon which well-marked tuberculosis may ensue.

Special attention was devoted to the consideration of the subject at the Congress on Tuberculosis held in Paris in 1888, and the President, M. Chauveau, confirmed the results of the experiments made by himself and MM. Villemin and Cornil on its artificial production in healthy animals fed upon tuberculous matter. This had been previously demonstrated by M. Toussaint, who had also proved that the bacillus of tubercle can withstand a high degree of heat without losing its vitality, so that he had produced the malady in cattle by feeding them with the juice expressed from the steak of a tubercular ox, cooked so as to be slightly underdone. To this crucial experiment was added the equally weighty and practical statement, as the outcome of investigations by MM. Strauss and Wurtz, that these bacilli were not destroyed by the action of the gastric juice, when ingested by the human subject. Their method of action appears to be by the production of a fermentative process, and this, once in operation, is not arrested by the death of the bacillus. The chief resolution arrived at by this Congress was—

“That every means, including the compensation of owners, should be taken to bring about the general application of the principle that *all meat derived from tubercular animals, whatever the gravity of the specific lesions found in them, should be seized and totally destroyed.*”

For the past three years, the French Government

has been contemplating the extension of a law, passed in 1881 (to prevent the spread of the contagious diseases of animals), to include cases of tuberculosis; and the President of the Republic signed the necessary decree during the session of this Congress. This decree is of great sanitary significance: it provides that every animal of the bovine species found to be suffering from this malady shall be isolated, and that a veterinary inspector shall be present when it is slaughtered, and make a report on the post-mortem appearances: the flesh is to be condemned as unfit for consumption if the lesions are generalised or have affected any part used as food. Two other resolutions were adopted, to the effect that, tubercle being now legally included in France among the diseases recognised as communicable, a special system of inspection of dairies should be established to ascertain that the cows are not in a condition to communicate any contagion to the human subject through milk; and that steps should be taken to spread among the public a knowledge of the danger incurred by the ingestion of the flesh or milk of tubercular animals. In reporting these results, the *British Medical Journal* (September 29, 1888), is of opinion that "it appears that by far the most important work achieved by the Congress was the adoption of these resolutions. They deal indeed with only one element in the etiology of tubercular disease, but that not the least influential in its action, while practically it is the

most important, because its operation is most under control."

Similar measures are now advocated in Germany, and at a meeting of the Berlin Medical Society in March of this year Dr. Richter urged that the sale of meat from tuberculous cattle should be forbidden by legislative enactment. In this country the British Medical Association has represented to the Government the necessity of stringent regulation of our meat supply; and at a recent meeting of the Scottish Veterinary Association, a resolution was carried unanimously in favour of legislation with a view of suppressing the consumption of meat from tuberculous animals, and of securing a proper inspection at the *abattoirs*. Indeed, the communicability of the malady has now become so fully recognised that preventive measures are entirely based upon the adoption of the principle. Thus in a paper read before the Epidemiological Society of London (January 9, 1889), Dr. Squires stated that "the discovery of the tubercle-bacillus has enabled us to place phthisis in close relationship to infectious diseases, towards whose control preventive medicine has already done so much; and experiment has proved that tuberculous disease can be communicated from affected to healthy animals. Phthisis depends primarily upon the reception into the body of an infective particle or micro-organism, and the possibility of infection through the alimentary tract assumes importance from

the prevalence of tuberculosis in animals which are used as food."

The general public, equally with the medical profession, has become imbued with the need of guarding against the danger; thus we read in the *International Review*, October, 1888:—

"The civilised world is rather apathetic about consumption. It has gotten rid of the plague and nearly rid of typhus epidemics; leprosy has been driven out of England, and smallpox has been rendered manageable; but one death in seven from all causes is still due to tubercle of the lung, and a part of the remainder is due to other tuberculous diseases. If we feared these as they merit, we should in turn suffer less from their ravages. But we have strangely grown used to them, and view them with a sort of fatalistic indifference."

A very recent and weighty utterance is that of Dr. Klein, who, from his position at the Brown Institution, is undoubtedly the highest practical authority on the subject in this country. His opinion, having been sought by the *Glasgow Herald*, is given in that paper on May 27 of the current year. He states that tuberculosis in cattle and in man is the same disease, and that it is communicable by ingestion. The agent of distribution is the circulating blood, and therefore no part of an animal in which even a single organ is visibly affected with tubercle can be held free from the virus, and there is danger to the consumer of any part

of the flesh of the animal. He also points out the risk involved to man by other diseases of cattle used as food; for while nothing is yet known regarding the transmission to human beings of many infectious maladies of animals, he questions the advisability of permitting their use for food, owing to the poisonous substances produced by the microbes in the circulation. Dr. Klein remarks that it is singular that, centuries ago, the Jewish Church seemed more alive to the dangerous rôle that the meat of diseased animals plays in affecting man than our rulers appear to be at this day, notwithstanding scientific discoveries and exact experimental evidence. Among the maladies indicated in its code as rendering an animal unclean and unfit for consumption, none is more clearly described than that we nowadays describe as tuberculosis in cattle. Further information on this point was given by Dr. Noël Gueneau de Mussy, Honorary Physician to the Hotel-Dieu of Paris, and member of the Academy of Medicine, in a paper presented to that body in 1885, in which he associates much of the vitality of the Jewish race with the care exercised by them in the selection of their food supply, and affords details, on the authority of the Grand Rabbi of France, of their method of slaughtering and examining cattle. I need make no apology for borrowing somewhat copiously from this paper.

“There is so close a connection (he writes) between the thinking being and the living organism in man, so

intimate a solidarity between moral and material interests, and the useful is so constantly and so necessarily in harmony with the good, that these two elements cannot be separated in hygiene, that is, in the science whose object is to assure the regular evolution and normal functions of individual organisms, and the preservation and amelioration of races. It is this combination which has exercised so great an influence on the preservation of the Israelites, despite the very unfavourable external circumstances in which they have been placed; it is, in short, the end which hygiene ought to aim at. The idea of parasitic and infectious maladies, which has conquered so great a position in modern pathology, appears to have greatly occupied the mind of Moses, and to have dominated all his hygienic rules. He excludes from Hebrew dietary animals particularly liable to parasites; and as it is in the blood that the germs or spores of infectious disease circulate, he orders that they must be drained of their blood before serving for food. The Talmud, a commentary on the Mosaic law, whose ordinances are regarded as of equal authority, goes much further, and occupies itself not only with the species, but also with the state of health of the animals to be used for food; it prescribes an examination of the principal organs, especially the lungs, rejecting such as have adhesions either between the tissues of the lobes themselves, or between them and the ribs, and also if there be pustules disseminated,

even superficially in the lungs. The lung must be insufflated, and its expansion so perfect that any rupture of its substance, however minute, suffices for its condemnation as impure, and, to avoid all chance of error, the insufflation must be conducted under water. These ordinances are to this day observed by Israelites faithful to the law, and duly appointed officers visit the slaughter-houses to superintend their execution. The chief rabbi of France says that sometimes as many as twenty-six out of thirty cattle are rejected on account of pleural adhesions. What an extraordinary prescience! the contagion of tuberculosis has been proved only during the last few years; its transmissibility by food is not yet universally recognised, though the experiments of M. Chauveau render it almost certain; yet the law of Israel, thousands of years in advance of modern science, had inscribed in its precepts these ordinances, preventive of the malady. For if such adhesions have any other causes beyond the presence of the tubercle, this is by far the most common, and though adhesions may exist without tubercle, the latter is very rarely present without the former. Here then we have an easy and practical method, within reach of ignorant persons, of removing from food supplies the flesh of tuberculous animals; and for further security the law, in addition to, and even in the absence of, such adhesions, pronounces as impure and unfit for food, animals whose lungs show pustules or excrescences disseminated on

their surface. The word 'pustule' is the translation, in ordinary parlance, of the word 'tubercle.' Physicians will not read without surprise this delicate procedure of insufflation of the lung under water, which we employ to show any rupture of these organs—a rupture in the great majority of cases consecutive to tubercular lesions. . . . The formal obligation of washing of hands before meals, laid down in the Talmud, is evidently inspired by the thought that noxious particles may adhere to their surface and penetrate with the food to the digestive tract; this precept being the more important as at that epoch (as now among the Arabs) the hands were used at meals, just as we read in the description of the Last Supper of 'him that dippeth his hand with me in the dish.' . . . Under their primitive forms (concludes Dr. de Mussy) these laws still subsist, and those who adhere to them dispersed, according to the prediction of their great legislator, to the four winds of heaven, derive from them a force and a vitality which carry them in triumph over the obstacles they encounter and the persecution they have suffered; . . . and from whatsoever point of view it be regarded, in considering the immense rôle played by Israel's great lawgiver, and the indirect influence which he still exercises over the civilised world, it is difficult not to recognise in him one of those providential men placed by the Creator on the path of humanity to guide it to the end which He has ordained."⁵

⁵ *Étude sur l'hygiène de Moïse et des anciens Israelites.*

Finally, the question remains to be discussed: are there grounds for the belief that the Jewish race is especially endowed with privileges tending to insure a degree of protection against morbid influences and to prolong life? Its comparative immunity from the tubercular diathesis has been recognised by all physicians whose special experience entitles them to express an opinion, and is the more remarkable when the adverse conditions under which the vast majority live are taken into consideration. The medical officers of health in some of the poorest quarters of London, where the bulk of the Hebrew population dwell, have repeatedly commented upon this fact in their official reports. Dr. Loane, the medical officer of Whitechapel, states, 'I am sure from personal knowledge that phthisis exists among the Jewish inhabitants of my district to a much less extent than it does amongst the remainder of the population living under precisely similar conditions.' Dr. Gibbon, the medical officer of Holborn, has borne testimony to the same effect; and Dr. Drysdale, the senior physician to the Metropolitan Free Hospital, which contains wards for Jewish patients, writes⁶ 'that they very rarely die of phthisis, and their immunity from its attacks is very striking.' He adds that they are, as all know, very particular about the kind of meat supplied to them for food. And, though I am loth to introduce my own personality into the discussion, I

⁶ *British Medical Journal*, April 6, 1889.

think it but right to state that in a practice of thirty years, largely among Hebrew patients, I have not yet met with a single case of phthisis in the members of that faith.

It is, of course, not asserted that any specific cause is sufficient *per se* to bring about constant and invariable biological results; all that I claim for that under consideration is that it is an important factor, and that operating during a countless series of generations, and acquiring increased force by constant hereditary transmission, it exercises an important influence in building up the physical toughness, and thereby the mental acuteness, so markedly characteristic of the Jewish race. As Professor Hosmer says ⁷—

“Throughout the entire history of Israel the wisdom of the ancient lawgivers in these respects has been remarkably shown. In times of pestilence the Hebrews have suffered far less than others; as regards longevity and general health they have in every age been noteworthy; and at the present day in the life insurance offices the life of a Jew is said to be worth much more than that of men of other stock.”

We have seen that the action of the tubercle-bacillus is comparatively inert when it comes in contact with healthy tissues; but when these are weakened, whether by heredity or disease, its morbid effects are rapidly developed; and as the tissues of the human body are

⁷ ‘The Story of the Nations : the Jews.’

built up of the food ingested, it is almost needless to say that their strength must as much depend upon the character of that food, as the strength of a house depends upon the quality of the materials employed in its construction. A storehouse of information on the subject exists in the encyclopædic work of Neumann,⁸ of which the first volume, published in 1883, is devoted by its author, Eugen von Bergmann, to the history of the development of the German, Polish, and Jewish population of the province of Posen. The large number of Jews in this province affords ample basis for comparison in all vital statistics, which have been carefully registered for fifty years; and compare them how we may—from a period before birth to extreme old age—the results are, without exception, favourable to their claims to special biostatic privileges. I say a period before birth advisedly, because in no other phase is vitality so well marked as in the comparative rarity of stillborn children. Now Von Bergmann shows that in the district of Marienwerder, from 1819 to 1873, the percentage of stillborn children among Christians was 2·66, among Jews 0·63; in that of Danzig 3·38 and 0·99: in Oppeln 2·93 and 0·69. In the whole of the eastern provinces of Prussia, the proportions were as 3·76 to 1·72; in Westphalia 3·11 and 1·38; and in the entire province of Posen, from 1849 to 1873, 3·32 and

⁸. *Beiträge zur Geschichte der Bevölkerung in Deutschland seit dem Anfange dieses Jahrhunderts.*

1.05 per cent., or less than one-third. Legoyt⁹ confirms those results, and states that in the kingdom of Prussia, whereas among Christians one child out of 44.88 is stillborn, among Jews there is but one in 97.75.

Advancing a stage to the mortality among infants in the first year of life, we meet with results equally striking, the deaths in the eastern districts of Prussia, from 1820 to 1870, being among Christians 23.81 per cent.; among Jews, 15.06. In the province of Posen, the proportions are 23.50 and 16.53: in the district of Marienwerder, 22.66 and 10.97; in that of Danzig, 23.95 and 14.04; in that of Oppeln, 23.91 and 12.64; in Westphalia, 17.16 and 10.84: and in Baden, 25.94 and 16.72. Other statisticians confirm these figures, thus Hoffmann¹⁰ finds that of all children born alive in Prussia from 1822 to 1840, there die in their first year, 1 in 7.5 of Jews, and 1 in 6 of Christians, and Dr. Loir¹¹ states that in Padua more than two-fifths of the Christian infants die in the first year of life, and not quite one-fifth of the Jewish.

From the first to the fifth year of age, the percentage of deaths in the province of Posen from 1819 to 1863 was among Christians, 37.48, among Jews, 28.69; in the district of Bromberg, 37.72 and 26.47; in that of

⁹ *Reports of the Statistical Society of Paris.*

¹⁰ *Petits Ecrits Economiques.*

¹¹ *Sources des Actes de Naissance, 1845.*

Marienwerder, 36·87 and 21·28; in that of Danzig, 37·14 and 23·24; in Berlin, 39·44 and 27·59; in all the eastern provinces of Prussia, 36·41 and 25·65; and in Westphalia, 28·52 and 18·35. In Fürth, Mayer shows that Jewish children under five years of age die at the rate of 10 per cent., Christians at that of 14; and in Frankfort, Neufville finds the proportions 12·9 and 24. 'We see, then,' says Von Bergmann, 'throughout that the Jewish mortality is less in the first year of life, and this favourable condition increases with each succeeding year; and even in the rare exceptions in which Jewish mortality is in excess during the first year, its diminution between the first and the fifth years becomes very striking.'

We meet with similar results in the more mature periods of life. Thus, the annual death-rate at all ages in the province of Posen from 1824 to 1873 was, among Jews, for every 10,000, 2·22, among Christians, 3·38; in the district of Posen, 2·28 and 3·29; in that of Bromberg, 2·09 and 3·57; in Marienwerder, 1·73 and 3·56; in the district of Danzig, 1·88 and 3·44; and in that of Oppeln, 2·02 and 3·38. In Pomerania, during the same period of fifty years, the proportions were 1·58 and 2·61; in Eastern Prussia, 1·63 and 3·35; in Westphalia, 1·62 and 2·69; in the Rhenish Provinces, 1·82 and 2·70; in the whole of Prussia, 1·95 and 3·00; and in Baden, 1·94 and 2·68. In Austria, from 1861 to 1870, the Jewish mortality was as 2·14 compared with

3·02 among the Christian population ; in Russia, 2·3 and 3·8, despite the crushing poverty and the unsanitary conditions in which the great mass of the Hebrew inhabitants exist ; in Tuscany, 2·34 and 2·75. In Saxony, of the Jews, 1 succumbs in 51 ; of Christians, 1 in 33. In Prussia, the latest statistics show that the mean duration of Jewish life averages five years more than that of the general population ; and official returns from Algeria give 1 Jewish death in 40·8 as compared with 1 in 21 among others. Dr. Mayer¹² states that in Frankfort 54 per cent. of Jews attain their 50th year, and 38 per cent. of Christians ; and the 70th year of life is reached by 27 per cent. of the former and by but 13 per cent. of the latter. Half the Jewish population there attain their 50th year, half the Christians die by their 36th ; one-fourth of the Hebrew inhabitants of the city pass their 71st year, while barely one-fourth among the Christians reach their 60th. Dr. Neufville, also writing of Frankfort, shows that, assuming 100 individuals to be born on the same day, one-fourth would die before their 7th year of Christians, and not till their 28th year of Jews ! half of the former at 36½ years of age, of the latter at 53 ; and three-fourths under 60 and at 71 years respectively. And Dr. Mayer adduces statistics of a decade of the mortality in Furth, giving the average duration of life there of Christians as 26, and of Jews as 37 years.

¹² *Ueber die Lebenserwartung der israelitischen Bevölkerung gegenüber der christlichen.*

At the meetings of the Statistical Society of Paris in July and August, 1865, M. Legoyt read papers on 'The Vitality of the Jewish Race in Europe,' in which, after stating many facts confirming these results, he quoted an exhaustive study of the subject by Dr. Glatter, the Government Medical Officer of Wieselburg¹³ (presented to the Academy of Hungary in 1856), in which, after a minute comparison of the respective mortality at all ages—from birth to 100 years—the conclusions were so favourable to the vitality of the Hebrews that M. Legoyt said :—

“The facts on which these observations are based present phenomena so characteristic and so uniform through a long series of years that it is difficult not to recognise in them these privileges and this immunity of the Jewish element. The advantages attributed to it by Dr. Glatter are the more remarkable because the Israelites in that locality belong to the most modest social condition; they are petty retail traders, living from hand to mouth, and consequently placed in unfavourable hygienic conditions; yet, comparing the respective races, we find the mean chance of life of Croats to be 20·2 years, of Germans 26·7, of Jews 46·5, and our surprise is excited at the considerable number of the latter who attain extreme old age.”

And the *Revue Scientifique* summarises their physiological immunities as showing that everywhere stillborn

¹³ *Sur les Chances de Vie des Israelites comparees aux Chrétiens.*

II.

IN a paper which appeared in this Review in September 1889, I drew the attention of its readers to the subject of the communicability to man of the diseases of animals consumed as food, and I gave a *résumé* of the evidence which had accumulated in proof of the position maintained by the leading scientific authorities in every country, as to the risk of the virus of specific maladies being conveyed by the ingestion of affected meat. The importance of the inquiry centres in the question of the transmissibility of Tuberculosis, because not only is this the most frequent morbid condition in cattle, and the most destructive to human life—being accountable for nearly half the deaths between the marriageable ages of fifteen to thirty-five years in Great Britain, and for one-fifth of the entire mortality—but also because Koch's brilliant discovery of the bacillus has set at rest all doubt as to the cause of the malady, and as to the question of its identity in man and the lower animals. No subject has more uninterruptedly engaged the attention of pathologists during the past twelve months, or is more likely to lead to results of the greatest practical importance: it has been discussed in the legislative assemblies of Europe and America, with a view to the settlement of the manifold difficulties, legal and scientific,

II.

IN a paper which appeared in this Review in September 1889, I drew the attention of its readers to the subject of the communicability to man of the diseases of animals consumed as food, and I gave a *résumé* of the evidence which had accumulated in proof of the position maintained by the leading scientific authorities in every country, as to the risk of the virus of specific maladies being conveyed by the ingestion of affected meat. The importance of the inquiry centres in the question of the transmissibility of Tuberculosis, because not only is this the most frequent morbid condition in cattle, and the most destructive to human life—being accountable for nearly half the deaths between the marriageable ages of fifteen to thirty-five years in Great Britain, and for one-fifth of the entire mortality—but also because Koch's brilliant discovery of the bacillus has set at rest all doubt as to the cause of the malady, and as to the question of its identity in man and the lower animals. No subject has more uninterruptedly engaged the attention of pathologists during the past twelve months, or is more likely to lead to results of the greatest practical importance: it has been discussed in the legislative assemblies of Europe and America, with a view to the settlement of the manifold difficulties, legal and scientific,

by which it is surrounded; and public attention having been thoroughly roused to the gravity of the issues at stake, their solution is imperatively demanded in the interests alike of the large and important classes engaged in the supply of food to our markets, and the immeasurably larger and more important classes engaged in its consumption.

The links in the chain of scientific evidence, based upon experiments conducted through a series of years, may be thus formulated: (1) Tuberculosis is caused by a minute vegetable organism, the bacillus; (2) this organism is identical in man and the lower animals, any slight apparent difference being purely morphological; (3) the disease is communicable from cattle to the human subject; (4) one of the most frequent methods of this communicability is the ingestion of the flesh of animals specifically affected; and (5) the ordinary modes of cooking do not destroy the bacillus, and have absolutely no effect upon the spores which are the chief means of its propagation.

As regards the first premiss, Koch says:

“In the experiments made with pure cultures, tubercle bacilli only, freed from all contamination with the original and morbid products, can have been the cause of tuberculosis. That proves the truth of the proposition that it is an infective malady, depending on the presence of the bacilli. It has been asserted that they are one cause of it, but that other things may

also have the power of inducing it. This statement is erroneous because, in all cases of true tuberculosis, the bacilli are present, and the manner in which they appear further proves that they stand to the disease in the position of cause.

And in an 'Address on Bacteriological Research,' delivered a few weeks ago at the Berlin International Medical Congress, he states :

"In another important fundamental question also the conditions are much clearer and simpler than before, that is to say, with regard to the proof of the causal relation between pathogenic bacteria and the infectious diseases connected therewith. The idea that micro-organisms must be the cause of infectious diseases was early expressed by several leading spirits, but the general opinion could not bring itself to accept the notion, and showed itself very sceptical with regard to the first discoveries in this domain. All the more was it desirable in the first cases to prove on irrefutable grounds that the micro-organisms found in an infectious disease are actually the cause of that disease. At one time the objection was always brought forward that there was nothing more than an accidental coincidence between the disease and the micro-organisms ; that the latter did not play the part of dangerous parasites but of harmless guests, which found, in the diseased organs, conditions of life which were wanting in healthy bodies. Many, while acknowledging the pathogenic properties

of the bacteria, believed it possible that, under the influence of the morbid process, micro-organisms, accidentally or constantly present, which were otherwise harmless, became converted into pathogenic bacteria. If, however, it can be proved, first, that the parasite is met with in each individual case of the particular disease and under conditions which correspond to the pathological changes and the clinical course of the disease; secondly, that in no other disease is it found as an accidental non-pathological guest; and, thirdly, that if completely isolated from the body, and cultivated in pure culture with sufficient frequency, it can reproduce the disease, then it can no longer be considered an accidental accompaniment, but in that case no other relation between the parasite and the disease can be admitted than that the parasite is the cause of the disease.

“This proof has now been furnished in the fullest measure with regard to a number of infectious diseases, such as anthrax, tuberculosis, erysipelas, tetanus, and many diseases of animals, generally all those diseases which are communicable to animals. At the same time it has further been shown that in all the cases in which the constant and exclusive occurrence of bacteria in an infectious disease has been established, they never behave as accidental guests, but like the bacteria already certainly known to be pathogenic. We are, therefore, fully warranted in affirming that, even if only

the first two requirements of the proof are fulfilled, that is to say, if the constant and exclusive occurrence of the parasite is established, the causal connection between parasite and disease is validly proved."

Dr. Fleming, late principal veterinary surgeon to the British Army, quoting this dictum of the greatest of bacteriologists, adds:

"From his researches Koch concludes that the presence of bacilli in the tubercular masses constitutes not only a concomitant fact in the process, but that it is the cause—a cause which had hitherto been only suspected, and which presents itself in the form of a vegetable parasite."

In his evidence in the Glasgow case, which has been aptly designated 'epoch-making' in this country, Dr. Coats, the pathologist to the Infirmary in that city, stated: ¹

"I go on the footing that the bacillus is the agent of the disease, not only in bovine tuberculosis, but also in man; and that in an animal that is tuberculous the distribution of the bacillus is very difficult to determine, and quite beyond the possibility of thorough detection."

In the same inquiry, Professor M'Fadyean, lecturer in pathology in the Royal Veterinary College of Edinburgh, said that it was conclusively proved that the bacillus is the cause of the disease, and that it is not

¹ 'Proceedings at Trial at the instance of the Glasgow Local Authority against Hugh Couper and Charles Moore.'

possible to have the disease without it. Professor M'Call, inspector for the Privy Council for the city of Glasgow under the Contagious Diseases (Animals) Act, deposed that it is the specific organism which produces the malady, and that there can be no tuberculosis without the previous presence of the bacillus; and Sheriff Berry, in delivering judgment, said :

“I take it to be established by the evidence as now the accepted view of most scientific men who have investigated the subject, that the disease known as tuberculosis is not only accompanied, but caused, by a minute specific organism, the bacillus, and that this bacillus in the tuberculosis of oxen and some other lower animals is the same as that which is found in the human subject.”

The Departmental Committee of the Privy Council, appointed by the Lord President in 1888 to inquire into the subject, reported (§ 21) that—

“the bacillus has been proved to enter the body and kill the animal by causing the growth of tubercles in the following ways: (1) by inhalation, into the air-passages; (2) by swallowing, into the alimentary or digestive system; (3) by direct introduction into the subcutaneous or submucous tissues by means of a scratch or cut. It is also supposed to be directly transmitted by (4) heredity.

And at the Congress on Tuberculosis held at Paris in the same year,² and attended by three hundred of the

² *Comptes rendus et Mémoires du Congrès pour l'étude de la Tuberculose chez l'homme et les Animaux.* Paris, 1888.

leading European experts, the meeting was practically unanimous as to the bacillus being the sole ^{as} ~~casual~~ agent. This point being held as established, the President, M. Chauveau, traced the various steps by which the identity of human and bovine tuberculosis had been shown: of this identity, he said, there could be no longer any doubt, and it was necessary to reckon with the fact, and with all the consequences that it entailed. There was but one single malady, one single virus attaching itself to the human and the bovine species, and capable of passing from one to the other. They were therefore compelled to admit that the milk and flesh of the latter might be a source of danger to man. When that opinion was first pronounced in the Academy of Medicine on the 17th November, 1868, there was a great outcry against the imprudent individual who, on the strength of laboratory experiments, dared to bring forward such alarming views.

“But things [continued M. Chauveau] have changed since then: the opinion has made progress, and now, throughout the civilised world, the authorities are seeking to devise measures to prevent the propagation of tuberculosis by means of the flesh and milk of affected animals.”

A few months later an official report was made to the New York Board of Health by the Pathologists to the Department,³ adopting the resolutions passed at the

³ *New York Medical Record*, xxxv. 643.

Paris Congress as being the logical deductions from facts ascertained by direct experiment. And an inquiry instituted by the North of Ireland Branch of the British Medical Association, and carried out by Drs. Burden, Lindsay, Strahan, and Colwell, resulted in a Report which was unanimously accepted by the Branch in December last, endorsing the view that the identity of the malady and of its cause in man and the lower animals had been established beyond all reasonable doubt, any difference in the size or growth of the bacillus being due solely to change of medium.

We have then a consensus of opinion as to the causation of the class of diseases known as tuberculosis, and as to its absolute identity in man and animals. The importance of these considerations will be more fully appreciated when we consider that they form the basis upon which our hopes must be founded for the arrest of its ravages; and these hopes are now beginning to be realised. In the address already quoted Koch communicates a fact of the utmost value to suffering humanity, that, moved by these arguments, he has devoted his attention, since his discovery of the tubercle bacillus, to seeking substances which could be used therapeutically, by hindering the growth of the bacillus in the animal body.

“More than this [he says] a remedy cannot do. It is not necessary, as has often been erroneously asserted, that the bacteria should be killed in the body: in order

to render them harmless there it is sufficient to prevent their growth and multiplication."

He has discovered many substances which will check their growth in a test-tube, but until recently none which will affect this in the body of an animal. But he is now able to announce :

" I have at last hit upon a substance which has the power of preventing the growth of tubercle bacilli not only in a test-tube, but also in the animal body. All experiments in tuberculosis are of very long duration ; my researches on this substance, therefore, although they have already occupied me for nearly a year, are not yet completed, and I can only say this much about them, that guinea-pigs which, as is well known, are extraordinarily susceptible to tuberculosis, if exposed to the influence of this substance, cease to react to the inoculation of tuberculous virus, and *that in guinea-pigs suffering from general tuberculosis, even to a high degree, the morbid process can be brought completely to a standstill, without the body being in any way injuriously affected.* From these researches I, in the meantime, do not draw any further conclusions than that the possibility of rendering pathogenic bacteria in the living body harmless without injury to the latter, which has hitherto been justly doubted, has thereby been established. Should, however, the hopes based on these researches be fulfilled in the future, and should we succeed in the case of one bacterial infectious disease

in making ourselves masters of the microscopic but hitherto victorious enemy in the human body, then it will soon also be possible, I have no doubt, to obtain the same result in the case of other diseases. This opens up an oft-promised field of work, with problems which are worthy to be the subject of an international competition of the noblest kind. To give even now some encouragement to further researches in this direction was the sole and only reason why I, departing from my usual custom, have made a communication on a research which is not yet completed."

The next, and from a practical point of view the most important, issue is as to its communicability by alimentation. In my earliest papers on the subject, written ten years ago, I adduced abundant scientific evidence in support of such transmissibility; further experimental proof has since been freely forthcoming at the hands of Toussaint, Galtier, Peuch, Nocard, Arlong, and other pathologists, and it has now received the sanction of a legal decision. In the Glasgow case already referred to, in which the carcasses of a bullock were and cow, apparently only locally affected, condemned as unfit for food, Sheriff Berry stated that—

"The view that tuberculosis is communicable from one of the lower animals to man must, as the evidence shows, be considered an established scientific fact. . . . Whether ingestion be or be not the commonest way in

which the disease is communicated, it must certainly be regarded as one mode of its communication."

This ruling, which rejected meat as unfit that had hitherto been freely sold in open market, was based not only on the evidence adduced at the trial, but on the Report of the Departmental Committee of the Privy Council, with regard to which the Sheriff said :

"My immediate object in referring to it is for the purpose of emphasizing the conclusion that tuberculous disease is communicable by ingestion. If it were not so communicable the view of the Committee would have no foundation to support it. I take it, however, that there really is little dispute on the point. It was admitted on the part of counsel for the defence that the disease may be communicated by the drinking of milk, and, if that be so, it is impossible to maintain that it cannot be communicated by the eating of flesh. Indeed, we need not look further than the practice of condemning the meat of tuberculous animals as hitherto practised in Glasgow and elsewhere in order to see that the transmissibility of the disease by ingestion has long been recognised. Except on the footing that the meat was the medium of the transmission of the disease, it would be unnecessary and wasteful to exclude from the food supply the carcasses of animals which had suffered from tuberculosis. . . . These diseases are widespread and varied in form, and entail very grave

consequences. They still contribute too largely to the mortality, besides involving much suffering and distress even in cases where fatal consequences do not ensue, and unless the evidence of men of high scientific authority is to be disregarded, one of the means by which they are propagated is the consumption of meat of tuberculous animals.”⁴

This judgment, which will doubtless have very important and widespread results, based upon the conclusions arrived at by the Privy Council inquiry, and by the report of the Paris Congress, has been amply justified by the results of experimental investigation at the hands of physiologists of such eminence as Klebs, Woodhead, Chauveau, Villemin, Cornil, and Klein, so that, in the words of the *Lancet*, ‘the teachings of experimental pathology are positive on the point.’⁵

The majority of these experiments indeed go to show conclusively that the disease is communicable by ingestion with great facility, and the probability is that this is a much more frequent method of infection than that of inhalation. The manner in which the bacillus operates as the medium of transmissibility has now been clearly demonstrated, for it has been proved that the minute organism resists the process of ordinary cooking, and its vitality is unaffected by the fluids of the alimentary canal. Toussaint many years ago produced the malady in cattle by feeding them with the

⁴ Glasgow case, pp. 410, 413.

⁵ May 3, 1890.

juice expressed from the steak of a tuberculous ox cooked so as to be slightly underdone; and the experiments of Gerlach and Johne on animals fed with cooked tuberculous flesh resulted in the conveyance of the infection in twenty-two per cent. The Privy Council Committee formulated the conclusion 'that the ordinary methods of cooking are often insufficient to destroy the bacilli buried in the interior of the limbs.'

"It seems that the life of the bacillus [to quote Sheriff Berry's judgment once more] may be destroyed by exposure to a temperature considerably under the boiling point of water, provided the exposure is for a lengthened period; but a large portion of cooked meat is used for food without having been subjected to the action of a high temperature for any great length of time, and, in the case of roasted meat in particular, it is often eaten underdone, with the juices little affected by the action of heat. Besides this, one mode in which bacilli are propagated is by spores, and in the opinion of scientific men the spores, like the seeds of vegetables, are less easily affected by heat than their parent bacilli. Consequently the spores may survive an amount of cooking which would be fatal to the bacilli themselves. The evidence leads me to the conclusion that it would not be proper to trust to cooking as a sufficient protection. . . . I have been deeply sensible of the responsibility of condemning as unfit for food meat which under the practice hitherto followed in Glasgow, and

still observed in various large towns of England, would apparently have been allowed to pass out for consumption. That practice, however, I am led to think, is attended with danger to the public health."

Professor M'Fadyean stated before the Privy Council Commission that cooking can never be relied on as a sufficient preventive; ordinary cooking is insufficient to destroy the bacilli, and utterly incompetent to affect their spores, which require a much higher temperature to become devitalised; and all evidence shows that the usual cooking of joints of beef and other parts is not sufficient to raise them even to 160 degrees, the temperature at which blood coagulates, and therefore insufficient to destroy the bacillus; and Sir Charles Cameron, Mr. Lingard, and Professor M'Call, experts of the highest authority, examined on the same occasion, confirmed this opinion. The medical officers of the Local Government Board in their last Report concur in the tenacity with which the spores resist all destructive agencies, to the extent indeed that no known process is competent to deprive them of vitality; and the Committee of the North of Ireland Branch of the British Medical Association state that the heat to which the inside of a large roast is raised is insufficient to destroy infectivity. The growth of a bacillus may be arrested at a temperature below 82 degrees, but it does not die: it can be slowly killed by being subjected for several weeks to a temperature of 107·5 degrees, and dies if

exposed to boiling point for half an hour; but a shorter exposure to this heat fails as a bacillicide, for in sixty-two experiments with tuberculous flesh soaked in boiling water for ten to fifteen minutes, positive results as to infection by feeding were produced in thirty-five per cent. So great indeed is the vitality of the bacillus that Koch still obtained the active microbe after conveying it through thirty-four generations of culture, for a time extending over twenty-two months: and the spores, the Committee add, are far more tenacious of life.

That the bacillus resists the action of the gastric juice and other fluids of the alimentary canal was first demonstrated by MM. Strauss and Wurtz, and later investigations have confirmed the results at which they arrived. Dr. Coats, the pathologist to the Royal Western Infirmary of Glasgow, says: 'That the juices of the alimentary canal are proved not to be fatal to the bacillus is shown by the frequency of tuberculosis of the intestines following tuberculosis of the lungs.' Indeed, it is self-evident that if the specific infection be caused by feeding animals with tuberculous flesh as has been repeatedly proved, the bacilli must have been unaffected by these fluids. The Blue-book issued by the Departmental Committee of the Privy Council in 1888 (§§ 24 and 25) states:

"Numerous experiments have similarly been performed upon the possibility of the tubercular virus

entering the body through the alimentary canal. In these experiments, tubercular secretions, *i.e.*, mucus, saliva, milk, &c., portions of tubercles from diseased tissues and cultures of the bacilli, have been swallowed by various animals, with the effect that the disease has fatally followed the ingestion of such infective material. It is obvious, therefore, that the digestive fluids do not necessarily exert an injurious influence upon the poisonous bacilli."

It might, then, be thought that if the bacillus had resisted the effects of cooking and of the fluids of the alimentary canal, no further impediments existed, and it would be at liberty to pursue its career unchecked, secrete its specific virus, and propagate its kind in the tissues. But happily this is by no means the case, and it is chiefly after its entrance, together with the products of digestion, into the lymph and blood streams that its struggle for life commences. We are but at the threshold of our knowledge of this subject, one of the most deeply interesting of the problems of pathology, and one which holds out the brightest hopes of our ultimate success in dealing with the large and deadly class of specific diseases. As Sir Henry Roscoe has said,⁶

"Metschnikoff's experiments, supplemented by those of Dr. Ruffer and others, have shown that certain cells

⁶ Address on the Advancement of Science by Research, July 1, 1890.

of the animal body, termed phagocytes, identical with the well-known white blood-corpuscles, being endowed with the power of independent motion, wander not only inside but also outside the tissues, and *mirabile dictu* pursue, devour, and digest any stray bacilli with which they come in contact. This is the true battle for life, which, hitherto unknown and unobserved, is going on uninterruptedly in the animal body. These phagocytes are the watchful guardians of the body, upon whose action its health depends. You may observe their proceedings for yourselves under the microscope: you will see them fighting against the invading host and literally swallowing them up. Poisonous bacilli are constantly present in the body . . . those causing diphtheria and pneumonia have been met with in the mouths of healthy men, and yet no entrance of such microbes into the blood takes place. Why is this? Because these phagocytes pursue and annihilate them before they gain an entrance. The question as to the way in which the pathogenic microbes act on the animal organism is one which touches chemical ground. As I have said, every micro-organism during its growth secretes a poison which appears to be a specific one for each microbe. So far as we are aware these poisons are definite chemical compounds possessing definite properties . . . and allied to the poisonous compounds termed ptomaines. In the case of certain well-known organisms, we have been long acquainted with the

specific poisons which they secrete. The yeast-plant yields alcohol, carbonic acid, and other products: the vinegar-plant turns alcohol into acetic acid, and in many other examples each organism during its life forms a special product. In less well-known instances we may therefore conclude that the same thing holds good; indeed, the existence of soluble poison capable of inducing the disease has been proved in the case of the bacillus of diphtheria. . . . But we are unable as yet to state the conditions under which the phagocytes of the lungs and tonsils are able on the one hand to seize upon and destroy the invading hosts of pathogenic bacilli, or, on the other, fail to prevent their entrance, and cease to keep the guard on which the health of the body depends."

Wherever the bacillus comes in contact with these wandering cells, whether prior to or after its entrance into the stream of the circulation, or when it has succeeded in effecting a lodgment in any of the tissues, a struggle takes place between the contending hosts, on whose result depends the issue of life or death to the part—eventually it may be to the entire body. In some cases, happily the great majority, where the constitution is unimpaired, the result is favourable to the cells, and the bacillus perishes; in others, where the tissues are weakened and the phagocytes share in the debilitated condition—whether produced by heredity or any depressing cause—the bacillus triumphs, finds a

nidus suitable to the needs of its existence, propagates its kind and leads to the development of a tubercular lesion. How constantly this struggle is being waged may be conceived from the fact that it has been calculated by Bollinger,⁷ that one phthisical person may eject from his body in the course of twenty-four hours twenty millions of the bacilli.

It may then be taken as proved that the bacillus in all cases is derived by one animal from another, and grows only at a temperature approaching that of the human body; its chief if not its only place of multiplication is in the living tissue, and when it has found a suitable resting-place it commences its mission, propagating by spores and by fission, and secreting alkaloids dangerous to animal life, and leading to an alteration in the normal structure by the formation of tubercles, such lesions being an absolutely characteristic sign of the disease.

“No human being can contract tuberculosis except as the result of the tubercle germ entering into his body—the bacillus or its spore.”⁸

“It is the propagation of the tubercle bacillus that leads to the production of the tubercle,⁹ and when the mischief has culminated in the formation of the tubercle, the bacillus and its products may be distributed in other

⁷ *Deutscher Med. Wochenschrift*, Oct. 1889.

⁸ Professor M'Fadyean, Glasgow case, Q. 2,856.

⁹ *Ibid.* Q. 2,875.

parts of the frame which appear quite unaffected: 'there is no organ in the body in which this specific organism does not seem to thrive; it has been found in the eye, in the inside of the bones, the glands, the lungs, the brain, and the flesh.'"¹⁰

We have now arrived at the consideration of the practical question as to the *degree* in which the flesh of an animal affected with tuberculosis is rendered unfit and dangerous for human food. It is on this point that the divergence of opinion centres, and upon its solution all legislation has been and must be based. It is admitted unanimously that if the disease be *generalised*, that is pervades the tissues throughout, resulting in emaciation and loss of healthy colour of the flesh, it must unhesitatingly be condemned, though even here innumerable cases of evasion occur; such cattle known as 'mincers' or 'wasters' are largely bought up by peripatetic dealers, and converted into sausages or sent to markets where the inspection is known to be lax. But if the malady be *localised*, that is, confined to one or more of the internal organs, and the flesh is firm and of good colour, the ordinary practice in this country is to remove the affected portions and 'strip' away their lining membrane, passing the remainder as first-class meat. It is this practice which is engaging the attention of pathologists, most of whom protest against it as full of danger to the

¹⁰ Professor M'Call, Glasgow case, Q. 2,990.

consumer, and they have succeeded in other countries against its sale as first-class meat. The advocates for the admissibility of such flesh as food base their opinion on the theory that localised tuberculosis may never spread, that the chance of infection from apparently sound flesh is too remote to justify its condemnation, and that parts of the body distant from the affected portions are free from tubercle, and cannot infect if taken as food. In the words of the *Edinburgh Medical Journal*, June, 1889:

‘The bacillus, having found its way into a tissue, joint, lymphatic gland, &c., may remain there for years incapable of doing mischief, if the constitution is good; and its power for evil varies according to the amount of impairment of this nutrition.’

The arguments *per contra* are to the following effect: it is proved that localisation of the tubercle is no safeguard against the escape of the bacillus into the lymph or blood streams; M. Cornil has shown that it has the power of penetrating healthy mucous membrane, and that the minuteness of the spores enables them to be carried into every tissue: they are, indeed, so small that, though visible by the microscope when in the parent microbe, they cannot be detected when dissociated from it. Both bacilli and spores, having thus escaped from the local lesion, exist in the tissues for a considerable period before the fact of their presence there becomes recognisable, and when it is recognised

the mischief is done and it is too late to adopt remedial measures.

To quote some leading authorities on this point of vital importance to the argument: Professor Klein states:

“Though we may not by naked-eye inspection or even by microscopic examination be able to detect the tubercle bacilli in the muscles or connective tissues, how can we be justified in excluding their presence from the circulating blood, including the blood in the muscles and the connective tissue?”

Mr. M. Geoch, the Inspector at Paisley under the Infectious Diseases (Animals) Act, is of opinion that “though the visible signs of tuberculosis in cattle may be local, the disease itself may have permeated the whole frame.”

Dr. Coats, the Pathologist to the Glasgow Infirmary, testified that

“there is nearly always a leakage of the bacillus into the lymphatics and the blood.”

Professor M'Fadyean says:

“Although tuberculosis may be strictly local to commence with, there is the tendency, or there is the danger, at any rate, of it becoming general if the bacillus burst into the blood stream; and we can never declare with certainty that in any particular carcass this has not occurred, because if the bacillus have escaped into the blood stream and settled in different

organs, it takes some time—a week or ten days probably—to determine the formation of tubercles.”

Professor M‘Call, the Principal of the Veterinary College of Glasgow and Inspector for the Privy Council, states that a longer period than this would probably elapse after the specific organisms had entered the body before we became aware of their presence, sometimes weeks or months.

Mr. Robinson, Examiner in cattle pathology for the Royal Veterinary College, believes that when a visible tuberculous centre exists, there is every probability that the generalisation of the disease has begun throughout the whole system of the animal, and that it is a hazardous thing for the life and health of the community to allow any part of a tuberculous animal to pass into food.

Mr. Maylard adopts the views of Koch, in whose *clinique* at Berlin he studied, that the bacilli may make their way into the lymphatic glands without any indication of their presence, even by the microscope, and that the virus may be circulating through the healthy organs and tissues in a carcass, although it is not found obviously manifesting itself: and he adds from his experience as surgeon to a children’s hospital that forty per cent. of the patients on the surgical side are tuberculous, and a possibly greater proportion would be met with on the medical side.

Dr. Wallace, the Medical Officer of Health for

Greenock, has acted there for the last five years on the principle that, however slightly an animal may be affected with tuberculosis, the entire carcass is unfit for food, and must be condemned, and this view is endorsed by Mr. Cope, the Chief Inspector of the Agricultural Department of the Privy Council, and by Sir Charles Cameron, Medical Officer of Health for Dublin, who deposed ¹¹ before the Departmental Inquiry :

“I must say that, be the condition satisfactory or otherwise, I unhesitatingly condemn any animal that has tubercle in any part of it.”

Koch writes that the bacillus may escape from the original tubercular focus, reach the interior of the larger blood vessels, and be disseminated by means of the circulation in larger or smaller numbers throughout the body, and thus localised tuberculosis develops into generalised ; and Veyssi re has shown that purely local tuberculosis is very rare : an examination of eighty-one cases yielding only two that could be so characterised. The practice of stripping away the lining membranes of the cavities whence the diseased organs have been removed is deemed not only inoperative to protect the unaffected organs, but likely to facilitate the spread of the infection, the mode in which it is conducted being unscientific, and the knife which is employed to remove the affected membrane penetrating the apparently

¹¹ Blue Book, p. 252, Q. 2,930.

healthy tissues and probably conveying the bacilli to them. So that, as Sheriff Berry sums up :¹²

“The practice has been, in cases where the disease, as far as appeared to the naked eye, was confined to the internal organs, to ‘dress’ or ‘strip’ the carcass—that is, to strip away the lining membrane of the chest cavity and the internal organs, and to allow the rest to pass into the market for food. My conclusion from the evidence is that this is not a sufficient protection against the risk of communication of the disease by ingestion. There may be no appearance visible to the naked eye of the action of the tubercular bacillus in a particular part of the animal, and yet it may not improbably be there. The presence of the agent of the disease must precede the visible results of its action. Indeed, the present case affords an illustration of the danger of inferring from the absence of symptoms visible to the unaided eye that the disease is localised: as far as could be judged by such symptoms there was but little indication of disease beyond the internal organs; yet, on examination under the microscope, bacilli were seen in the prepectoral gland, a part of the animal which, although the carcass had been stripped, would have been passed out into the market as fit for the food of man.”

This decision was avowedly based on the conclusions arrived at by the various congresses, committees, and

¹² Glasgow case, p. 411.

Government inquiries which have been held during the last three years to consider the subject in all its bearings. Various local authorities in this country having taken common action induced the Privy Council to appoint a Departmental Inquiry in 1888, which reported on the 10th of July of that year ¹³ that—

“The distribution of the disease and the bacillus closely affects the question of the use of tubercular meat as food. It appears that the marrow of the bones is affected at an early period, and that the bacilli may be present therein in considerable quantities before they discover themselves by changes obvious to the eye. Evidence has also been laid before us to show that, although rarely, the disease may affect the flesh, and that the ordinary methods of cooking are often insufficient to destroy the bacilli buried in the interior. Further, although the bacilli may be found but rarely in the flesh, *still the chance of their being present either there or in the blood is too probable to ever allow of the flesh of a tubercle animal being used for food under any circumstances*, either for man or the lower animals.”

A few weeks later, on the 31st of July, the Paris International Congress on Tuberculosis voted by a majority of three hundred to three, that

“Every possible means should be adopted, including compensation to parties interested, for the *general application of the principle of seizure and destruction in totality*

¹³ Report of the Privy Council Committee, § 43, &c.

of all flesh belonging to tuberculous animals, no matter how slight the specific lesions found in such animals."

The official report of the pathologists to the Health Department of the City of New York in 1889 states that¹⁴

"Tuberculosis is a strictly preventible disease, and may be induced, and is indeed transmitted, by the milk and flesh of tuberculous cattle. One of the obvious means of prevention, therefore, is the avoidance of such articles of food, and those measures of prevention alone answer the requirements which embrace the governmental inspection of dairy cows and animals slaughtered for food, and the rigid exclusion and destruction of all those found to be tuberculous."

The North of Ireland Branch of the British Medical Association adopted the conclusions presented by its committee last year, that there is a certain amount of danger in allowing the flesh of an animal, even only locally affected, to be sold for food; to what extent this risk extends they were not prepared to say, as it probably varies in different cases. And the Branch passed a resolution

"That in view of the recent discoveries with regard to human and bovine tuberculosis, and to the opinions held by many scientific authorities concerning the communicability of tuberculosis from man to animals, and from animals to man, and in view of the enormous prevalence of the disease in one form or another among

¹⁴ *New York Medical Record*, xxxv. 643.

mankind, this branch disapproves of the practice of allowing any part of an animal which has been shown to have been affected with tuberculosis to be sold as sound and wholesome meat."

And, finally, a Commission appointed by the Victorian Parliament in 1889 recommended the seizure and destruction of all infected animals, alive or dead, dealing with them as though scheduled with pleuro-pneumonia under the Contagious Diseases (Animals) Act.

The unanimity of these decisions—all arrived at within the last two years—shows the progressive growth of scientific opinion, for the earlier Congresses, as that of Lyons in 1883, of Brussels in the same year, and of the Hague in 1884, sanctioned the use of the flesh of animals only locally affected with tuberculosis, leaving a discretionary power of rejection to the inspector if he found the colour of the flesh impaired.

It will however be readily understood that in view of the enormous interests at stake, *legislation* has not yet adopted these requirements in their entirety, though in most countries it is steadily advancing towards their enactment. In France, the Government, actuated by the resolutions of the Paris Congress of 1888, added tuberculosis to the list of contagious maladies scheduled under their Act of 1881, and formulated the code, now known as the French Tuberculosis Regulations, to the following effect:

"(1) When tuberculosis is recognised in bovine

animals during life, the Prefect shall make an order placing them under the surveillance of a veterinary inspector. (2) Every animal recognised tubercular shall be isolated and sequestered, and shall not be removed except for slaughter: the slaughter shall be carried out under the surveillance of a veterinary inspector, who shall make an autopsy of the animal and send to the Prefect a report of the same within the period of five days. (3) The flesh of tuberculous animals shall be excluded from consumption, (a) if the lesions are generalised, that is to say, not confined exclusively to the visceral organs and their lymphatic glands; (b) if the lesions, although localised, have invaded the greater part of an organ, or are manifested by an eruption on the walls of the chest or of the abdominal cavity. Such flesh is excluded from consumption, and also the tubercular viscera shall not be used as food for animals and should be destroyed. (4) The utilisation of the skin shall not be permitted until after disinfection."

Germany, with its usual scientific precision, has adopted a system of compulsory public slaughter and inspection, which has revealed the extraordinary prevalence of the disease in cattle, and has at the same time rendered it impossible for flesh consumers to eat tuberculous meat unwittingly. In Berlin alone, in 1888,¹⁵ 'tuberculosis was detected in 4,300 cattle and

¹⁵ *Journal of Comparative Pathology*, March, 1889, quoting Adam's *Wochenschrift*.

6,393 pigs: the entire carcasses of 985 of the former and 1,442 of the latter were destroyed, while 8,322 parts or organs were withheld from consumption as first-class meat.' Flesh exposed for sale in Prussia is classified into such as is unmistakably free from tuberculosis, and may be freely sold at butchers' stalls; and such as has been taken from animals locally affected, which can only be sold at a public stall (*Freibank*) by a city *employé*, a ticket or seal being affixed to each portion giving intimation to the purchaser of the cause of its having been remitted there: it is priced cheaply, as of mediocre quality, and it is sold under such strict control as to render it impossible that it can be bought as above suspicion. The law passed in 1885 says:

"The condition of the flesh of a tubercular animal is to be regarded as dangerous to health when the meat contains nodules or the animal has begun to show emaciation, *even although the tubercles are not visible in the meat*, while, on the other hand, the meat is to be regarded as fit for food when the tubercles occur only in an organ, and the beast is in general well nourished."

The care with which these regulations are enforced in Berlin may be estimated from the fact that there are no less than 138 persons engaged in the inspection of meat there, including physicians, veterinary surgeons, and microscopists, Koch himself being the *Gesundheits-Rath*, or chief of the Sanitary Council; while in one of our largest cities, Birmingham, this duty, involving the

supervision of 300 slaughter-houses, is delegated to two individuals.¹⁶ Similar regulations to those of Prussia exist more or less throughout the whole of Germany; and in Austria the flesh, however good it may appear to be, is condemned if the lymphatic glands of the chest and intestines are affected.

The most thoroughgoing legislation is that enforced by the Jewish Church, of which I have given abundant details in my previous papers, and have supplied statistical proofs of the relative infrequency of tubercular disease, which I believe to be in great measure dependent upon the extreme care exercised over the meat supply.

“Qualified inspectors [says the *British Medical Journal*, April 12, 1890] examine all flesh intended for human food; the blood is scrupulously removed, and a board sits *en permanence* for the guidance and supervision of the inspectors. Fully one-fourth of the carcasses examined are rejected, mostly from tuberculous affections, and when the meat is passed as fit for food a seal is attached to each portion exposed for sale. Most of the Continental regulations for the inspection of meat are based on the system of the Jewish laws, though they do not come up to them in stringency. . . . It remains for our legislators to adopt, directly or in a modified form, such of these laws as have been proved

¹⁶ Evidence of Dr. A. Hill, Medical Officer of Health in Birmingham, Glasgow case, p. 282.

to be of value, and to fill up with the aid of the knowledge and experience resulting from modern investigations those gaps which are now known to exist, so that we may have a more complete code of meat inspection and control."

And the *Temps*, in a *critique* of my article in this Review, concludes :

"Tous ces faits sont évidemment de nature à appeler l'attention des hygiénistes sur les prescriptions talmudiques en matière d'alimentation, et l'on ne voit pas pourquoi les règles de la boucherie juive, consacrées par l'expérience de tant de siècles avant de l'être par le verdict de la science contemporaine, ne deviendraient pas des reglements d'utilité publique. Nous avons assurément déjà fait à la civilisation israélite plus d'un emprunt moins profitable et moins justifié."

In this country legislation is conspicuous by its want of uniformity—one might even say by its absence; there is no efficient system of inspection or control; the local authorities and medical officers of health issue contradictory orders, and meat condemned as unfit for food in one market is freely allowed to pass into consumption in another. In the Glasgow case, the cattle in dispute, rejected by the health officers of that city, of Greenock, Paisley, and Edinburgh, were declared perfectly suitable for food by those of Sheffield, Hull, Birmingham, and the Holborn district of London, who deposed that they would unhesitatingly have let

them go into the market. Again, the *Belfast Northern Whig* tells us that one day a magistrate ordered the destruction of some tuberculous meat, and a few days later two other magistrates refused to give an order for the destruction of two carcasses clearly shown to be similarly affected, alleging as their reason a disinclination to give such a decision as would have a ruinous effect upon the cattle trade of the country, adding that if tuberculosis were a serious disease like pleuropneumonia, the Government should make provision for the compensation of the fleshers. On appeal the justices of the peace ordered this meat to be destroyed as unsound and unwholesome.

“The present system or want of system is radically bad. Farmers, cattle-dealers, and butchers have no solid ground on which to stand. One day they may be fined and the next acquitted; by one medical officer their fault may be condemned, by another, condoned; and by one judge they are told the law says this, and by another that it says something very different. No wonder is it then that the butchers wish to form themselves into a jury in disputed cases. They would, at any rate, be thoroughly consistent in their arbitration.”¹⁷

It is true that during the last twelve months medical officers of health and sanitary inspectors have paid increased attention to the subject, and large numbers

¹⁷ *British Medical Journal*, Nov. 2, 1889, p. 990.

of cattle have been condemned which would previously have been freely passed into our food supplies. It is, unfortunately, equally true that a large percentage of the animals still admitted into our markets—a proportion varying from 0·2 to 50 per cent.¹⁸—is tuberculous, and the flesh is daily consumed for food. There is, besides, a growing amount of evidence to show that the proportion of bovine tuberculosis bears a distinct relation to that in man, a relation standing directly in the light of cause and effect. In 1881 the authorities of Baden issued a chart applying to fifty-two towns in that duchy, which demonstrated that where the disease is most prevalent among cattle it is also most frequent in the human subject, and that it is especially prevalent in such towns as possess the largest number of low-class butchers. This statement was borne out by witnesses examined before the Departmental Committee of the Privy Council (questions 5,115, 6,367, and 8,791), and Sir Lyon Playfair has pointed out that when tuberculosis increases among

¹⁸ 'Report of Departmental Committee of the Privy Council,' Q. 4,263. In the 'Milroy Lectures,' delivered before the Royal College of Physicians for 1890 by Dr. Ransome, the statement I made some years ago, that an inspector of the Metropolitan Meat Market testified on oath that 80 per cent. of the flesh sent there had tubercular disease is declared to be exaggerated. I can only repeat that the statement was made by Dr. Carpenter, and is to be found in the *British Medical Journal* of October 7, 1879; probably it does not apply now, as the inspection of cattle has become more stringent.

cattle, consumption in some form or other, but chiefly mesenteric or intestinal, increases among children. Even admitting the possibility of the localised disease being free from mischief, a possibility disproved by the evidence which I have adduced, it is clearly impossible to decide at what period the localised condition becomes generalised, and it is beyond the power of any one to determine that in what appears to be a purely local affection, the germs of the malady have not already been carried into the system. The responsibility for the assumption that no harm can accrue from the ingestion of such meat is certainly not to be taken lightly, and is in direct opposition to the teachings of experimental pathology. The rôle of science in the question has been thoroughly played out, and its case proved to the hilt; its functions have now lapsed, and it devolves upon the Legislature to profit by its demonstrations, and to adopt such measures as may best protect the public from this ever-present scourge.

In the debate in the House of Commons during the past session, the necessity of scheduling tuberculosis under the provisions of the Contagious Diseases (Animals) Act, was strongly advocated by Mr. Knowles, Sir L. Playfair, Dr. Farquharson, and others; but was objected to on the ground *inter alia* that it would create an 'unpleasant feeling' in the public mind. But the subject has by this time taken so firm a hold upon the public mind that a far more 'unpleasant feeling'

will be created if no steps are taken to institute precautionary measures against the danger of infection: it has passed the stage of examination by scientists and experts, to whom the Government has once more referred it, and unexceptionable as is the composition of the Royal Commission, which has just been instituted for its investigation, its appointment is to be deprecated as necessarily deferring legislative enactments. The results of experimental pathology, continuously carried on since the announcement of Koch's discovery, have established the fact beyond the possibility of doubt that there are very appreciable dangers connected with the consumption of meat derived from cattle affected with tuberculosis, and though there is not absolute unanimity as to the degree of these dangers, yet it is amply sufficient to prove the existence of peril great enough to warrant the immediate adoption of preventive measures. Such measures indeed are called for in the interests alike of producers and consumers. A deputation representing the meat trade of the United Kingdom had an interview with the Minister of Agriculture and the President of the Local Government Board on the 21st of April of this year, to state the grievances to which they were subjected by the present unsatisfactory condition of the law, and to seek protection against the condemnation at the hands of local sanitary authorities of cattle apparently healthy and sent into the market for food supply, such condem-

nation entailing not only pecuniary loss, but also the risks of a criminal prosecution. And they asked that, until an authoritative decision should be arrived at as to the fitness or unfitness of such meat, an appeal might lie against the decision of the medical officer of health or sanitary inspector to some official to be appointed by the Board of Agriculture, compensation being granted in case of condemnation, as is the practice where cattle are slaughtered for 'scheduled' diseases, their claims being specially enforced because the home producer is unfairly handicapped by the introduction of foreign meat to an unlimited extent free from any similar inspection.

Practically, indeed, the question has now resolved itself into the apportionment of the loss entailed by the restrictive measures which must be adopted. The breeder sells his beasts, to all appearance healthy, to the butcher, who, buying them at a fair price, sends them to market, where they are condemned as tuberculous, and he has to bear the entire penalty of their confiscation, a penalty which he naturally thinks unfair. The adjustment of the loss is undoubtedly a difficult matter, but it is one that will of necessity diminish as the malady becomes minimised by rigorous inspection. The more restricted the foci of infection, the more quickly will the disease be stamped out, and as soon as it is discovered that tuberculous cattle cease to pay, the supply will be cut down to the demand. If the meat

that is now rejected in such markets as enforce a proper inspection finds no sale in others, it will soon cease to appear in the hands of either butchers or consumers. Whether compensation is to be awarded out of the local rates, out of slaughter-house dues, or, as is the case in Denmark, out of a fund raised by mutual insurance in the trade, is a matter that must be left to the decision of Parliament; but that economic measures must yield to the paramount consideration of public health and safety is undoubted. As the law stands at present, the Local Government Board is powerless to interfere with the manner in which each local authority may choose to deal with suspected meat, and it follows, therefore, that flesh is freely passed as fit for human food in one borough which would be totally condemned in another. Assuredly this solution, if the word applies, of the problem is as unsatisfactory and dangerous to the consumer as it is hazardous, perhaps ruinous, to the purveyor; and unquestionably until Parliament chooses to arrive at a final decision, temporary legislation should be enacted by which the British public may obtain the minimum of protection afforded in continental countries, as for example by the abolition of private abattoirs, a careful examination of the food supply by qualified inspectors, and a provision that meat derived from tuberculous cattle, howsoever slightly they may have been affected, should be marked as such, and sold only in a special market and at a lower price.

The purchaser would buy it with his eyes open, content to take what risk there may be, while those who prefer paying more for meat from animals entirely free from localised tuberculosis, would be relieved from any doubts as to the absolute reliability of what they buy, a feeling which no one, except the inhabitants of three or four towns in Scotland, is at present privileged to entertain.

The Minister of Agriculture, in a letter to the *Times* on the 26th of April, 1890, asks, if the statement I made in this Review be correct as to our markets being flooded with tuberculous meat, how it is, if it be so specifically dangerous, that phthisis does not increase? The question is readily answered by a quotation from my paper:¹⁹ 'It is, of course, not asserted that any one specific cause is sufficient *per se* to bring about constant and invariable biological results; all that I claim for under that consideration is that it is an important factor.' And as the *Sanitary Record*²⁰ pertinently inquires, 'Is Mr. Chaplin sure that phthisis is not increasing?' Has he any reason for believing that the proportion of such meat used as human food is increasing? The increased attention paid to sanitation, the better housing of the working classes, the improvement in the material condition of the masses of our population, and innumerable other causes, tend to diminish the death-rate from tuberculosis as from other diseases.

¹⁹ *The Nineteenth Century*, Sept. 1889, p. 418.

²⁰ May 15, 1890.

The *Times* concludes that the evidence I have adduced is of a sufficiently grave character to attract public attention, and that the question raised is one of vital importance, and one that cannot be lost sight of until it is finally solved. Meantime, let us ponder over the weighty words of Mr. Herbert Spencer:²¹

‘The first requisite in life is to be a good animal, and to be a nation of good animals is the first condition of national prosperity.’

²¹ *On Education*, p. 146.

III.

IN the two earlier papers which I have written on the dangers attributable to the consumption of the flesh of tuberculous cattle, I have collated the evidence afforded by the experiments of leading pathologists which have established beyond doubt the existence of a very real and grave peril, urgently demanding legal measures for the protection of the public health. Such legislation has to a certain extent been enacted in most countries, varying in degree according to the recognition of its necessity, and some governments have been compelled by the growth of public opinion to enforce laws of great stringency involving the strictest inspection of the meat supply, and heavily penalising all infractions of the regulations. A Royal Commission has been engaged in the study of the subject during the past two years, and the President of the Local Government Board stated a short time ago that it expected to complete all the experiments it had undertaken in the course of the late autumn, but that then some time must elapse before the whole of the information collected could be fully examined and reported on. The importance of the question, whether regarded from a sanitary, a scientific, or an economic point of view, has attracted to its study the ceaseless attention of skilled investi-

gators, and the advances which are daily being made in bacteriology have materially aided in the solution of the problems involved, and cleared the way for a final settlement of the difficulties which have hitherto stood in the way of a rational code of legislative enactments.

As I have already stated, the links in the chain of evidence which may now be taken as experimentally proved may be thus formulated :—

(1) Tuberculosis is caused by a minute vegetable organism, the tubercle bacillus.

(2) This organism is identical in man and the lower animals, any slight apparent difference being purely morphological ;

(3) The disease is communicable from cattle to the human subject.

(4) One of the most frequent methods of this communicability is the ingestion of the flesh of animals specifically affected ; and

(5) The ordinary modes of cooking do not destroy the bacillus, and have absolutely no effect upon the spores, which are the chief means of its propagation.

The evidence establishing these premises is so abundant that they are now taken as conclusively proved, and as forming the basis on which all further investigation is to be founded ; the issue being henceforth narrowed to one of degree, or, in other words, to the determination of the amount of tuberculous impairment which renders the flesh of cattle unsafe for human food.

On this point opinions still differ, and the battle is stoutly waged between those who hold that any local lesion, however slight, is sufficient to condemn the entire carcass, and those who consider that unless there be general tuberculosis, or grave affection of internal organs, the flesh may be regarded as fit for consumption. This division into *local* and *general* tuberculosis has been taken as the groundwork of legislation in foreign countries, where an attempt has been made to regulate the sale of meat in accordance with the degree of its specific impairment. Thus in Germany the law is to the effect that "a condition of the flesh of animals is to be regarded as dangerous to human health when the meat contains tubercular nodules, or the animal has begun to show signs of emaciation, even although the tubercles are not visible; while on the other hand the meat is to be regarded as fit for food when the masses of the tuberculosis only occur in an organ, and the beast is in general well nourished." And the French decree says:—

"The flesh of animals shall be excluded from consumption :

(1) If the lesions are generalised, that is to say, not confined exclusively to the visceral organs and their glands, and

(2) If the lesions, although localised, have invaded the greater part of an organ, or appeared as an eruption on the walls of the chest or the abdominal cavity."

Despite these legislative enactments, a considerable amount of tuberculous meat finds its way into the foreign markets. M. Colin, of Alfort, depreciates the French method of inspection, and illustrates the ignorance or carelessness of the inspectors by the statement that he has no difficulty in finding tuberculous meat in markets officially reported quite free; and Landouzy,¹ quoting the statistics of Bolz, of Kiel, that more than one-third of infantile deaths are due to tuberculosis, and confirming this by his own experience in Paris, says: "I shall never be weary of repeating at this moment of the discussion on the depopulation of France that tuberculosis of itself does more for the depopulation of our country than alcoholism, syphilis, and Malthusianism put together. It is worth while proclaiming far and wide that in France hardly anything is attempted to put men on their guard against tuberculous contagion, that everything remains yet to be done, and that in the matter of its prevention veterinary science is further advanced than the science of medicine as applied to man. It must be frankly owned that tuberculosis is contagious, and it should be clearly stated why and how the contagion spreads; the public should be as well informed in the matter of consumption as it already is as to scarlet fever, typhoid fever, or hydrophobia. To hereditary tuberculosis, so interesting to the specialist, must be assigned only a

¹ *Revue de Medecine*, No. 9, 1891.

small portion of that which decimates babyhood. But what is the use of saying this, if nothing is done to avoid contagion?" *The Times* of April the 23rd, 1892, referring to this statement of M. Landouzy, whose authority as a Professor in the Faculty, a member of the Academy of Medicine, and one of the Editors of the *Revue de Medecine*, it deems unquestionable, considers that he has made out his case that the excessive mortality from this cause in France is preventable by rules of common hygiene, and imperatively calls for State intervention to arrest it.

Whether the believers or the sceptics in the danger of localised tuberculosis be eventually proved in the right, there can be but one absolute safeguard—the inspection of every animal destined for human food, as carried out in many of the larger cities of Germany. In Berlin, no meat can be sold without it, and no animal can be slaughtered except in the public *abattoirs* where the most minute examination takes place before it is permitted to be removed by the dealer. Immediately upon its slaughter the carcass is numbered, and portions of the muscular and other tissues are removed by the inspectors and placed in small metal boxes bearing the same number—full particulars of the history and ownership of the beast being entered in a register for future reference. An examination of the internal organs is at once made by veterinary inspectors, any visible lesions ensuring immediate rejection; if none

be found, the contents of the boxes are taken to a series of tables at which a number of examiners are seated, each provided with a microscope of sufficient power to detect trichinosis or the ordinary forms of tuberculosis. These inspectors are thoroughly qualified as to all the details of their work by a course of practical study, and many of them are women; but if any case occurs in which the appearances are doubtful, the specimen is submitted to an exhaustive examination at the hands of a more experienced specialist, whose decision is final. Such meat as is passed as fit for food is divided into two classes: that which is absolutely free from tuberculosis or other disease may be exposed for sale without any restrictions, while that which has been taken from animals only slightly and locally affected can be sold only at a public stall (*Freibank*) by a civic employé, a ticket or seal being affixed to each portion, giving information to the purchaser of the cause of its having been remitted there; it is priced cheaply as of mediocre quality, though of course deemed free from the chance of conveying specific infection, and the conditions of its sale are under sufficient control to prevent its being offered as first-class meat. A similar method of inspection and regulation of the market supply is now being introduced into Russia.

No such stringent procedure exists in this country; a supervision of meat offered for sale is legally enacted, but it is for the most part in the hands of men who

are not qualified to form an opinion, and whose rough and ready methods offer absolutely no guarantee for the safety of the public. At the Annual Meeting of the British Medical Association in 1890, Mr. Walley, the Principal of the Royal Veterinary College of Edinburgh, read a paper on meat inspection, in the course of which he stated that there is practically no protection against those who traffic in meat unfit for human food, though from our relatively larger consumption it is more needed here than anywhere else. He considered that all animals intended for food should be examined by competent persons, and that as a necessary corollary all private slaughter-houses should be abolished, or in small towns or villages where this might be found impracticable, should be licensed and under the direct control of the sanitary authorities. Lay examination might suffice for the discovery of gross lesions, but a Board, consisting of a Medical Officer of Health, a veterinary surgeon and a lay inspector should be attached to each public abattoir, and none of these should be appointed without proof of special qualifications for the office. In the discussion which followed, a difference of opinion was expressed as to the amount of tuberculosis which should be held condemnatory, but it was unanimously agreed that the public needed safety at the hands of competent examiners, that the large towns received the worst meat, and that no proper inspection could be maintained over private slaughter-houses.

Dr. Duguid, Assistant Inspector of the Board of Agriculture, in an important report on "Tuberculosis in Animals in relation to Consumption in Man,"² accepts the fact of infection and the consequent necessity for legislation as proved; he thinks that as regards tuberculosis in cattle, "in its knowledge, both clinical and pathological, our veterinary surgeons are behind those of the Continent, no doubt from the fact that attention has not been so prominently drawn to the disease in this country as it has been abroad, where we hear very little of the difficulty of diagnosis, except in the very earliest stages," and he concludes that safety can alone be secured by the abolition of all unlicensed slaughterhouses, by the enforcement of the examination of all carcasses in the public abattoirs, and by the appointment of district inspectors in villages or groups of villages which are too small for public abattoirs.

Daily experience shows that quantities of tuberculous cattle are brought to our markets visibly unfit for food; thus at a meeting of the Nottingham Medico-Chirurgical Society, on January 2nd, 1891, Dr. Boobyer exhibited the organs of a cow which had been exposed for sale at the live stock market, every one of which, except the heart, were tubercular; the physical signs, general emaciation, arched back, retracted abdomen and staring coat, together with jerky respiration and frequent cough,

² *Journal of the Royal Agricultural Society*, August, 1890, Vol. I., Third Series.

were unmistakable indications which one would scarcely think could have escaped the knowledge of the vendor, but the magistrates declined to accept this view. The *British Medical Journal* (August 20th, 1892), says: "The position of those who have to decide regarding the wholesome or unwholesome character of meat from evidence heard in police courts is often not an enviable one. We recently called attention to a case in which the evidence for the defence was more than usually at variance with that for the prosecution, some witnesses declaring that the meat was utterly decomposed, while others maintained that it was sweet and wholesome. Another case, in which the evidence was only a little less discrepant, was recently tried at the Derby police court. . . . From reports in the provincial press it is scarcely possible to avoid the conclusion that the inspection of meat is left to persons having little or no knowledge of animal diseases, and hence unfitted to discharge that function. . . . These cases afford illustration of the slipshod methods of meat inspection almost general in this country; the interests alike of the meat consumer and of the butcher would be better served if inspection were made compulsory in the case of every animal slaughtered for human food, and if the duty were confided to men specially trained for the purpose."

Even in towns where local legislative enactments are framed with exceptional care, as, for instance, in

Glasgow, there is much room for improvement. At a recent meeting of the Philosophical Society of that city, Dr. Duncan called attention to the inadequacy of the existing method of meat inspection, pointing out that, as a matter of fact, at least ten per cent. of the cattle exposed for sale were tuberculous, while less than one per cent. were condemned; whereas, in Berlin, where the inspectors are experts, the rejections varied from one-half to twenty per cent. One inspector, a policeman without any technical training, had sometimes to examine two or three hundred carcasses in one day in Glasgow; and Dr. Duncan, in illustration of the dangers incurred, and the necessity for more drastic measures, cited a case in which, on the 8th April in the current year, a butcher in the north of Scotland sent some 300-lbs. of tuberculous meat to Glasgow by a circuitous route through Elgin; it was seized in Glasgow, and a prosecution ensued. In defence it was alleged that it had been sent only for the purpose of being boiled down, but the magistrate ruled that the meat had been dressed and forwarded to the market for sale as food, and that, in the hope of avoiding detection, it had not been sent by the direct route through Aberdeen, where the inspection has recently been very active. A penalty of £20, or sixty days imprisonment was imposed; and, on the same day, a second somewhat similar case incurred a less severe punishment. A memorial was sent to the Lord Provost

and magistrates of Glasgow from the Medico-Chirurgical Society, embodying a series of resolutions passed at a meeting on the 18th of December, 1891, calling their attention to the fact that tuberculosis is now fully recognised as an infectious disease, and asking them to take the matter into their serious consideration with a view to the protection of the community from its ravages. A committee of the Society having been appointed to formulate the views and objects aimed at in the resolution, directed attention to the established facts:—

“1.—That the one constant and necessary element of causation is the microbe, which grows and multiplies in the body of certain animals and of man, when introduced from without, and in so doing produces an intensely active poison, which is the direct agent in bringing about the morbid changes in the living structures. There are doubtless other elements in the causation, such as inheritance and acquired susceptibility, but the microbe is the only essential and constant one; and there is evidence to show that without any special susceptibility it may produce the disease, if introduced in sufficient quantity.

“2.—As the microbe will not grow except at a temperature identical with that of the body, the living bodies of men and animals affected are its great propagating places; they are the sources of the supply, and constitute the centres from which the infection is derived.

“3.—It is believed that tuberculosis is fairly to be compared as regards its infectious quality, if not with typhus and small-pox, at least with typhoid or enteric fever, although the mode and channel of the infection may be so different as to make it much less obviously dangerous to live in the same house or room with a case of consumption, than it would be in the case of one of the well-known contagious fevers. Tuberculosis, however, is much more disastrous in its results than all the other infectious diseases put together. According to the Annual Report of the Registrar-General for 1888, the deaths registered as due to it in Glasgow numbered 1824, and those assigned to all other miasmatic, that is, infectious diseases, including measles, scarlet fever, whooping cough, &c., were 1080. For reasons known to us it seems certain that the mortality from tuberculosis considerably exceeds that which appears in the Registrar-General's returns ; but even these figures are sufficiently striking. The deaths registered as tuberculous made up 15·5 per cent. of the total deaths in Glasgow in 1888. These facts imply a large amount of what may be termed “floating infection” in our midst.

“4.—The Town Council by its action in prohibiting the sale of tuberculous meat and milk has, in our opinion, very properly endeavoured to grapple with one source of the infection. It may be said that the great prevalence of the malady in cattle, especially in milch

cows kept in town, and therefore both more likely to be specially infected and to become in turn sources of infection through their milk, has justly been already considered by the authorities.

“We recognise the wisdom of a policy having for its object the removal of this source of infection, dangerous for man as well as for animals. It should be possible by rigid cleansing and disinfection of byres, and by the condemnation of animals known to be tuberculous, to stop this source of infection, and with the splendid sanitary organisation which Glasgow possesses, it should be possible to do much to cleanse our city from some of the principal causes of the wide-spread prevalence of this its greatest plague.”

As to the general method of inspection in this country, we are told by Dr. Marsden, the Medical Officer of Health for Birkenhead,³ that animals sent for the market supply are entered either marked specially “for inspection,” or simply put on the books of the abattoir with the owner’s name, and without any indication of their condition. These last are slaughtered and the carcasses dressed, perhaps even stripped of the membranes most susceptible of tuberculosis, before the inspector sees them, so that it is often very difficult for him—as the law does not allow him to cut into the meat or do anything with it beyond look at it—to produce sufficient evidence of disease, especially in cases of

³ *British Medical Journal*, May 28, 1892.

tuberculosis, to satisfy a magistrate that it is unfit for human food. If the animal is booked for "inspection," and most respectable butchers do so mark anything in the least suspicious, it goes into the suspected meat house, and cannot be taken away until the Medical Officer of Health has examined it. If condemned by him, and the owner is willing to sign an order for its destruction, this is at once effected, and the case does not come before the magistrate, thus sparing the butcher the publicity and unpleasantness which that course would entail. The weak point is the inadequacy of the law in not enforcing the inspection of all animals, and the absence of by-laws forbidding the removal of any portions of the carcasses before such inspection. Dr. Marsden concludes that "to enable Medical Officers of Health to deal effectively with the meat question, they will have to be given much more stringent powers than they at present possess, and there will have to be devised some means of compensation to the butchers." That much depends upon the character of those with whom the supply rests is well shown by the official chart of the Grand Duchy of Baden in 1881, which proved that in 52 towns tuberculosis was most prevalent in such as had the largest number of low-class butchers, and was most frequent in man wherever it was most frequent also in cattle.

The practical question as to the degree of tuberculosis which renders the flesh of an animal unfit for human

consumption was the subject of discussion at the Meeting of the British Medical Association held in Nottingham in August of the current year. Dr. Hope, the assistant medical officer of Liverpool, stated that the general practice followed in this country is to condemn it only if the disease is extensive or the flesh visibly deteriorated, though in a few localities any traces of tuberculosis, however slight, are deemed sufficient to warrant its condemnation, on the grounds that it has been repeatedly proved that the custom of "stripping," or removing the affected portion, does not suffice to eliminate the danger. The experiments of Toussaint, Bouley, Chauveau, Cornil, Arloing, Nocard, Peuch, Perlach, Johne and others have conclusively shewn that tuberculosis can be produced in healthy cattle by feeding them with the flesh or juice of animals specifically affected; and the manipulations employed in the removal of diseased portions in localised cases may be the means of carrying the bacillus to healthy parts. This view was upheld by others, and Dr. Boobyer (of Nottingham) deemed it inexpedient to limit the condemnation of the meat to such only in which the condition of the animal had been generally affected. Dr. Watts (of Aberdeenshire) concurred in this opinion, considering that if any part was involved, the whole carcass should be condemned, for if the bacilli themselves, introduced into the human system, could be destroyed by the acid secretions of the digestive tract,

their spores are absolutely unaffected by them, and being absorbed would be carried to the glands and vital organs. The chief opponent of the condemnation of animals only locally tuberculosis, was Professor Bang, of Copenhagen, who deemed the consumption of their flesh unattended by risk. In summing up the discussion, the Chairman, Dr. Tatham, contended that the practice adopted by most of our sanitary authorities could not be justified: tuberculosis meat is either dangerous or not; he thought it undoubtedly was, and that being the case, every affected animal should be destroyed.

The vitality of the bacilli has been recently demonstrated by a series of experiments of M. M. Lortet and Despeignes,⁴ which shew also the necessity of effectually disposing of infected cattle by cremation: they found that earth worms living in soil which contains tuberculosis material bring up the bacilli to the surface, and such worm-casts produce the most virulent tuberculosis in guinea pigs.

The pressing need of an official decision on the question of localised or general tuberculosis, that is, the amount of lesion which renders the flesh dangerous for food, is exemplified almost daily in our police courts. In a previous paper I referred to a typical instance which occurred in Belfast, where one day a magistrate ordered the destruction of some tuberculous meat, and a few days later, two other magistrates refused to give an order for the condemnation of two carcasses similarly

⁴ *Lyon Medical*. No. 29, 1892.

affected, on the ground that a contrary decision would, if generally carried out, have a ruinous effect upon the cattle trade of the country. Judgments of an entirely contradictory character are constantly arrived at: only a short time ago, the magistrates of Birkenhead decided a case in favor of a butcher because, though there was clear proof of the existence of tuberculosis disease, yet the glands had not been examined, and there was consequently no evidence of their infection. In the celebrated Glasgow case, the cattle in dispute, finally condemned by Sheriff Berry, and rejected by the health officers of that city, of Greenock, Paisley, and Edinburgh, were declared perfectly suitable for food by those of Sheffield, Birmingham, and the Holborn district of London, who deposed that they would, without hesitation, have let them go into the market. Commenting on the Birkenhead decision, the *British Medical Journal* (⁵) says:—

“This is the sort of case in which, until the question of general and local tuberculosis is settled, the meat ought to be marked as first or second-class, and it shows the necessity for a staff of skilled inspectors, for no microscopical examination had been made, and no demonstration of the presence of bacilli. Our country is one of the few in which the inspection is so superficial and faulty. The Royal Commission will probably express a decided opinion on the need which exists

⁵ *February* 21st, 1891.

for having trained inspectors, either veterinary surgeons or medical men well up in cattle pathology, and until this decision is announced, the existing uncertainty as regards convictions for tuberculous meat must continue."

And again (October, 1890), "Confidence is now lacking, in the absence of any system, both to the purveyors and the consumers of meat; and, though the initiation of a system would undoubtedly involve considerable expense, yet it would be quickly and abundantly recouped by the ultimate saving in life, health, money, and stock."

At the International Congress of Hygiene and Demography, held in London in August, 1891, Dr. J. Burdon-Sanderson, Waynflete Professor of Physiology in the University of Oxford, gave a lucid exposition of the principles which should guide final legislation on the subject. Assuming the identity of human and bovine tuberculosis and their inter-communicability as fully proved by repeated experiments, he considered the practical issues to be

(1) Is the risk to the individual consumer of such a nature that it can be detected and estimated?

(2) Is it of such a nature that it can be counteracted?

(3) Is the collective risk to which the community is exposed sufficient to demand the interference of the State? and,

(4) If it is, how can the State interfere with effect?

In discussing these questions, he stated that at the

Paris Congress in 1888, Arloing, adopting the view of the great pathologist, Toussaint, that tuberculosis is a condition affecting the entire system, urged that the time had now arrived when we should act "conformément à la logique"; he showed that of every six carcasses examined, one was proved to be infective, when tested by administering it experimentally as food to other animals, and he calculated that a thousand persons joined in the consumption of such carcasses, and, therefore, that one-sixth of this number, about 170, are subjected to the risk of infection for every animal sent to the slaughterhouse. His deduction was that whatever interests may be found to conflict with public health, must give way in such matters, and science alone has a right to dictate the course to be pursued. In considering this extreme view of Arloing, Professor Sanderson said that it is not sufficient to show that great mortality arises from tuberculous diseases, and that a cause exists to which much of it may be attributed, but we must demonstrate that this effect is produced by this cause. Are we in a position to affirm, that if the use of meat of tuberculous origin were effectively suppressed, the prevalence of tubercular diseases would be diminished? He did not deny that since Chauveau first succeeded, twenty-five years ago, in inducing the malady in healthy cattle by feeding them with tuberculous material,⁶ repeated experiments

⁶ *Bulletin de l'Académie de Médecine*, XXXIII., 22, 1868.

have confirmed the accuracy of his observations, and that pathologists of such eminence as Gerlach deduced from them the necessity for the enforcement of legal restrictions in the sale of meat; and he agreed that the question of the communicability of tuberculosis by the ingestion of food is to be regarded as unquestionably and finally settled in the affirmative. But is this sufficient to condemn the flesh of all animals found to be tuberculous in whatsoever degree? This is the crucial question, and Dr. Sanderson proceeded to state that up to the present it has been answered in two different manners, according to the view taken of the nature of the malady: those who hold that tuberculosis is necessarily a disease of the entire system, and that the bacilli, having once effected an entrance into the organism, contaminate every part of it, are of opinion that all meat derived from an infected source should be condemned, whatever be the degree of the impairment. Others, and Professor Sanderson declares himself to be one of them, think this view exaggerated, and he laid stress upon the fact that the malady is not only slower in its progress in cattle than in the human subject, but that it tends more in the former to localise itself in structures which are not essential to life, as in the membranes which cover the vital organs, rather than, as in man, in the organs themselves; and further, that it may remain quiescent for years without interfering with the nutrition of the animal in such a way as to

prevent its being sent to market in good condition, and sold as meat to all appearance of prime quality, and free from any risk of carrying infection.

"I hold, therefore," he concludes, "that in asking for the interference of the State we must not base our demand on the ground that the community actually suffers from the consumption of tuberculous meat. . . . But on the other hand I maintain that it is attended by some danger, and that on that ground its consumption ought to be watched over by the State and avoided by the individual;" and he added that as regards legislation, the only remaining question is the administrative one. Everything depends upon diagnosis, that is, the skill of a trained inspector to distinguish between infective and non-infective meat, which demands special scientific knowledge and technical training. It may be taken as proved that the ingestion of any material which contains the bacillus of tuberculosis is a source of risk, but the conditions which limit the amount of this risk are at present insufficiently known, and it may be finally asserted that two things on the part of the State are absolutely necessary—to include tuberculosis in the list of diseases of animals regarded by the law and scheduled as contagious, and to create an efficient system of skilled inspection.

In the discussion which followed Professor Sander-son's paper, Dr. Bang, of Copenhagen, said that it was now universally admitted that men could contract the

disease through the medium of meat, and that therefore danger existed ; but there was little unanimity as to the extent of the danger. Of course, if it were feasible, absolute interdiction of the use of infective meat would be desirable, but the economic point of view cannot be ignored in the enormous loss from so stringent a procedure, which would fall on countries where cattle tuberculosis is frequent. And it must also be borne in mind that it is only in a great minority of cases that the bacillus is found in the part consumed as food, the muscular tissue. Thus repeated experiments have shown that, in about seventy beasts, known to be tuberculous, only ten gave evidence of infection in the muscle juice on its injection into guinea-pigs and rabbits ; and sometimes the juice, though demonstrated to be virulent, produced the disease in only one of several animals inoculated with it. He concluded therefore that as long as the tuberculosis is strictly localised, the meat is not a source of sufficient danger to warrant its seizure and condemnation.

Professor Arloing, of Lyons, one of the highest authorities on the subject spoke next ; and, while admitting the difficulty of a “*diagnose précoce*” in cattle, held that the condemnation of meat was necessary in however slight a degree it might be affected. On the grounds of public safety he suspected all such flesh as dangerous, especially as it is so often insufficiently cooked, and the bacilli therefore remain pathogenic. He had collected

statistics which left no doubt in his mind as to the frequency with which this occurred, and though it might be possible to allow the flesh of locally tuberculous animals to be sold for food if its cooking were carefully supervised, he still maintained that its total confiscation was the safest method, and that a system of strict inspection was an absolute necessity.

Professor M'Fadyean, Lecturer in Pathology in the Royal Veterinary College of Edinburgh, and Dr. Woodhead, Director of the Laboratories of the Royal Colleges of Physicians and Surgeons, then contributed a paper, dealing with the statistics of the question as regards the seat of specific infection in children. They had found that in 127 cases, tuberculosis was present in the digestive tract in 43, and in the mesenteric glands in 100, or nearly 79 per cent., though in only 20 could the condition be diagnosed during life. They considered the muscular tissue of cattle more frequently affected than was generally admitted. Thus, of three cows slaughtered in one day, they had found well-defined tubercle in the muscles of two, and they concurred in the great need of a thorough inspection of all animals intended for food, though it might be that only in a certain proportion of such as were affected, their ingestion would be attended by danger. This view was adopted also by Professor Nocard, of Paris, who deemed the risk of infection especially great in

children, who are so remarkably liable to tuberculous disease of the digestive organs.

We see then that there is absolute unanimity on two important points, the existence of danger though varying in degree, and the need of skilled examination of every carcass destined for human consumption. At the meeting of the British Medical Association last year, Dr. Woodhead stated that experience has shown that the more perfect is the inspection of meat in any country, the higher is the proportion of tubercle; where the inspection is compulsory only in certain districts of a given country, the statistics in the inspected areas are usually twice to four times as high as in those which are uninspected, and it is evident from repeated observation that tuberculous carcasses are sent for food to these uninspected areas, and are consequently passed unchecked for consumption. Thus Bollinger has demonstrated that in Augsburg, the proportion of animals in which tuberculosis was detected in the years 1881 to 1888 was forty-five per cent., while with a more thorough system of inspection in 1889, it rose to eighty-eight per cent. Veterinary surgeons, here and abroad, give the probable percentage as thirty to forty, and if only one per cent. of these is dangerous as food—and this is certainly an irreducible minimum—the need of legislative restrictions is undoubted. Evidence given before the Departmental Committee appointed to enquire into the prevalence of pleuro-pneumonia and

tuberculosis in the United Kingdom, proved that the percentage affected with the latter malady in Ayrshire dairy cattle varied from twenty-five to fifty, and the French official reports declared that in January of the current year, no less than one hundred and ten localities in that country were specifically affected.

These statistics are borne out by the results of the examination of the cattle slaughtered in accordance with the requirements of the Jewish church to which I have frequently alluded; the latest returns which I have been able to obtain shewing that of 13,116 oxen killed in London, only 6,973 were passed as admissible for food: and in a period of five half years, forty per cent. of oxen, twenty-nine per cent. of calves, and twenty-three per cent. of sheep were rejected. It seems but reasonable to infer that the comparative immunity of the Jewish race from tuberculous maladies is largely attributable to the care exercised in the examinations of the meat supply; this immunity is now generally admitted, and was referred to this cause at the meeting of the British Medical Association by Dr. Bridge and Dr. Haughton, who considered that their superior vitality, though many lived under unsanitary conditions, tended to prove that the quality of the food must be an important factor in bringing about this result. The most recent contribution to the subject is that of Dr. Heron, one of the Physicians to the City of London Hospital for Diseases of the Chest, who,

after quoting the vital statistics given in my earlier papers, says:—

“Viewed in the light of modern research into the pathology of disease, it seems highly probable that the rules which control the Jews more or less in the matter of their food are calculated to have a most beneficial effect upon their health, especially where maladies due to bacteria are concerned. It seems, therefore, in a high degree probable that the amount of immunity which is enjoyed by the Jewish race is in no slight degree due to the observance of their dietary laws When a man with the experience of Sir Andrew Clark, unequalled perhaps in extent, says, and he kindly allows me to quote him, that he has not seen in private practice half-a-dozen cases of tuberculous disease of the lungs amongst his numerous Jewish patients, and when we look at the experience of others, we cannot but admit that the case is a strong one which supports the belief that Jews are in the enjoyment of a considerable immunity from tuberculous maladies.”⁷

The necessity which exists for the examination of every animal slaughtered for food is demonstrated by the difficulty of diagnosis during life. A typical case in point was reported lately at a meeting of the Academie de Médecine by M. Auguste Ollivier, who narrated the history of an outbreak of tuberculosis in a convent in Chartres. In the space of two years, five

⁷ Evidences of the communicability of consumption, 1890, p. 104.

of the girls, being educated there died from various forms of the disease, and twelve were affected. The cow, whose milk had supplied the convent for nine years, was sent to the abattoir, and though to all appearances in good condition while living, its flesh on examination was condemned by the veterinary inspector, being laden in parts with tubercle. M. Nocard also stated at this meeting that eighteen months previously, he had examined a fine calf of four months which had died suddenly, and found it stuffed with tuberculous nodules and quantities of bacilli. The calf had never had any milk but its mother's, and Nocard declared that the latter must be similarly affected; and though she was a splendid specimen of her breed, had gained many prizes at shows, and looked in perfect health and condition, yet a post-mortem examination revealed the presence of tubercle in the lungs, and the udder was infiltrated with tuberculous nodules.⁸ Again, Dr. Hirschfeld, the bacteriologist of the Brisbane Hospital, related to the Royal Society of Queensland the case of a cow apparently in excellent health and yielding an abundant supply of milk, yet the injection of Koch's lymph gave rise to an increase of temperature, and suspicion being thus excited the beast was killed, and an examination demonstrated the existence of numerous bacilli, and of extensive tubercular lesions communicating with the milk channels.

⁸ *Bulletin de l'Académie de Médecine*, 3eme serie, Tome xxv., No. 8.

We may now, however, entertain the hope that we are in possession of a method which will reveal the presence of the bacillus during the lifetime of tuberculous cattle with a fair amount of accuracy ; for though the *curative* effects of Koch's tuberculin from which such great results were anticipated, have hitherto not fulfilled these sanguine expectations, yet its *diagnostic* properties appear to be established, and to produce symptoms unmistakeably pointing to the existence of the specific malady. *The injection of the bacillus culture into the tissues of a tuberculous animal, though not sufficient to cause any serious injury, is found to intensify the morbid action in the affected parts, and to produce a marked rise in the body temperature, while it is not followed by any similar results in such as are non-tuberculous.* Repeated experiments at the hands of the most skilful pathologists tends to show that this re-action is almost always a specific sign of the presence of tubercle, and though the method is likely for the present to be confined to pedigree cattle, yet no doubt, if its success is confirmed, means will be found for bringing it into general use. A series of observations made by Gutmann at the Dorpat Veterinary Institution, and confirmed by Professor Bollinger, of Munich,⁹ goes far to establish the value of this means of diagnosis. Three cows in which tuberculous symptoms were fully recognised during life, and bacilli were detected in the milk

⁹ *Münchener Medecin Wochenschrift*, Jan. 13, 1891.

and bronchial mucus, were treated by injections of Koch's fluid. The temperature in all three began to increase in about eleven hours, and its elevation and duration corresponded to the amount of the tuberculin introduced. While they lasted they were accompanied by loss of appetite and difficulty in breathing, but the next day all these symptoms had passed away. In two healthy cows, to whom at the same time full doses of the injection were administered, no increase of temperature followed, and when slaughtered twenty-four hours later all the organs in both were found healthy. M. Nocard submitted 75 bovine animals to the action of tuberculin,¹⁰ and verified the results by post-mortem examination in every case. In from ten to twenty-four hours after a single injection, 19 showed signs of reaction by a great rise of temperature, and inspection after death demonstrated 17 of these 19 to be tuberculous in various degrees. Of these 17 thus diagnosed as specifically affected, 8 had been in such good condition while living that it would have been impossible to determine the presence of infective disease. Of the cattle which had given no reaction after the injection of tuberculin, several were found to have been suffering from various maladies, *but not one was tuberculous*. M. Nocard concludes that this method constitutes a most valuable means of diagnosis, that it should be generally employed, and that cattle which give signs of reaction

¹⁰ *Semaine Medicale*, October 14, 1891.

should be eliminated from the meat and milk supply, and should not be used for breeding purposes. Professor McFadyean, of the Royal Veterinary College of Edinburgh, has also placed on record experiments which go far to prove that in almost every instance the febrile reaction occurs in tuberculous animals after the injection, whilst in not a single instance among the non-tubercular was there any increase of temperature.

A most interesting illustration has recently come to us from America ⁽¹⁾. Some years ago Mr. Gillingham established a herd of Jersey cattle in the neighbourhood of Philadelphia, importing a number of cows and using all the leading strains of Jersey bulls. No expense was spared in the selection of additions to the stock, and every possible care was taken to secure their perfect health and to maintain them in the highest condition. In spite of all this, however, from time to time a few cases of tuberculosis occurred, and the infected animals were at once slaughtered and thorough disinfection enforced. A post-mortem examination having confirmed the diagnosis, Dr. Pearson, one of the Professors of Veterinary Medicine at the University of Pennsylvania, made a thorough examination of the herd, and found tuberculous symptoms in five of the cows, which were forthwith destroyed. But soon afterwards a cow, apparently in good health, and shewing no signs of emaciation, but which would not breed, was killed for

(¹) *Medical News*, March 26, 1892.

beef, and discovered after death to be highly tuberculous. Suspicion being thus aroused that the disease might exist among the remainder, though they were all doing well and in excellent condition, it was decided to use tuberculin, and to regard all the animals which gave the reaction as infected. A special Commission of the University of Pennsylvania, which had been investigating the subject, had demonstrated that an elevation of temperature after the injection of Koch's fluid occurred only when tuberculosis existed, and any exception to this was the result of imperfect observation. Dr. Pearson quoted an instance in the case of a cow in which tuberculin gave the characteristic reaction, yet on examination of the body, no tubercle could be detected; the beast was accordingly cut up for food, but on dividing the vertebral column, marked tuberculosis of the bones was discovered. Seventy-nine of Mr. Gillingham's herd were injected with tuberculin, and thirty gave the reaction; six of these were killed, and five of the six revealed the presence of tuberculosis to the naked eye; the sixth was doubtful, and required microscopical examination. All these thirty animals appeared perfectly healthy while living, and would have fetched high prices if offered for sale; but it was decided that every one which had reacted to the test should be slaughtered, and the herd thoroughly weeded of all doubtful elements. Commenting on the credit due to Mr. Gillingham for this honourable resolve, the *British*

Medical Journal says, ⁽¹²⁾ "To condemn to destruction thirty highly-bred, costly, and apparently healthy animals requires a good deal of moral courage. The temptation to sell or procrastinate is very strong, and it is to the interest of the community that the owners of suspected cattle should not lose too heavily. A considerable number of experiments bearing upon the diagnostic value of tuberculin in veterinary practice have now been published, and while the results obtained have not in all cases been quite satisfactory, the majority have summed up in favour of the agent. The four longest series of experiments are those by Bang, Nocard, Lydlin, and the staff of the Dresden Veterinary College, and in all of these the conclusions drawn were favourable to the employment of tuberculin as an aid to the detection of tuberculosis in cattle. On the other hand experiments conducted by such competent observers as Kitt and Arloing, have yielded somewhat disappointing results. Viewing the experiments as a whole, however, it appears to have been proved that, with very few exceptions, tuberculous cattle react to a subcutaneous injection of tuberculin, and that a similar temperature reaction is very rarely found in non-tuberculous animals."

Klebs claims that the injection of Koch's fluid, carefully freed from noxious ingredients, has been shown to be not only diagnostic, but absolutely curative in veterinary practice, but, whatever may be the thera-

¹² April 9, 1892.

peutic results, its value in detecting the presence of tuberculosis in living cattle—a problem so difficult of solution—can scarcely be over-rated. In the case of pedigree animals, it would be well worth while to determine the point whenever the slightest doubt arises, not only to preserve the purity of the herd, but also to avoid the risk of infection, and I hope that some of the owners of leading strains, or of the large cattle-breeders in this country, may be induced to prosecute this branch of research, whose interest and importance can scarcely be over estimated.

Whatever may be the outcome of the deliberations of the Royal Commission, and the legislative enactments based thereon, it must be borne in mind that there does not at present exist a staff of trained inspectors to carry them out in such a manner as to restore public confidence in our meat supply. Until this deficiency shall have been met, tentative and temporary measures can alone be adopted, such as the careful examination of all cattle and flesh destined for human food, the abolition of private slaughterhouses, the erection of public abattoirs and markets under strict supervision, and the division of meat passed as admissible into two classes—the absolutely healthy, and the slightly affected—the latter to be sold only with an official stamp and at a reduced price, or when thoroughly cooked in municipal establishments.

There remains but one point for consideration, the

adjustment of compensation ; the danger to the health of the consumer, and the financial loss to the producer, from the prevalence of tuberculosis are so great, that any proportion of compensation paid either by the State or the individual, would in a short time be saved by the diminution of centres of infection. It is manifestly unfair that the Government should bear the entire burden—a fact recognised in Germany and Denmark, and carried into practical operation in Copenhagen, where the butchers and cattle-dealers have formed an association for mutual insurance against the ravages of the malady, and have accumulated a fund out of which partial or complete compensation is paid for animals condemned by the inspectors. The question is very complicated, because it is not limited to home-bred stock, but extends also to such as is imported ; and this involves a system of inspection at the docks, or the compulsory slaughter of cattle brought to our shores. That this is no imaginary danger is shown by the United States' census, which gives a total of 868,000 tuberculous cattle in that country : a considerable proportion of the meat supply imported thence by us must be derived from this infected source, and no examination on its arrival would ensure safety, as the affected organs are almost invariably removed at the time of slaughter.

As I have already stated

“ The breeder sells his beasts apparently healthy

to the butcher, who, buying them at a fair price, sends them to market, where they are condemned as tuberculous, and he has to bear the penalty of their condemnation, which he naturally thinks unfair. The apportionment of the loss is undoubtedly a difficult matter, but it is one that will of necessity diminish as the malady becomes minimised by rigorous inspection . . . and as soon as it is discovered that tuberculous cattle cease to pay, the supply will be cut down to the demand. If the meat that is now rejected in such markets as enforce a proper inspection finds no sale in others, it will soon cease to appear in the hands of either butcher or consumer. Whether compensation is to be awarded out of the local rates, out of abattoir dues, or out of a fund raised by mutual insurance in the trade, is a matter that must be left to the decision of Parliament, but that economic measures must yield to the paramount consideration of public health and safety is undoubted."

If a scheme of mutual insurance were in the first instance adopted, and supplemented as far as needs be out of the local rates or imperial taxation, a method of compensation might be devised which would prove equitable to all concerned, and would secure the support and co-operation of the breeders and purveyors in carrying out a properly defined system of condemnation. That danger exists, and that it is especially pressing in the case of children, who are so liable to tubercular

affections of the digestive organs, is undoubted: the latest returns of the Registrar-General show that one-fifth of the entire mortality in this country is attributable to this class of maladies, and that nearly one-half of the deaths that occur between the ages of fifteen and thirty-five are due to tubercle of the lungs alone; and in Paris, in the year 1888, out of a total of 50,825 deaths, 11,592, or nearly one-fourth, were certified as caused by this scourge of humanity. If it can be proved, and I think abundant evidence has now been adduced to this effect, that one great source of its prevalence lies in the ingestion of infective meat, and that this can be effectively arrested by legislative enactments, wisely devised and rigorously enforced, the objects which I have had in view in the study of the subject will have been fully achieved, and the results of the labours of the pathologists, who have devoted ceaseless attention to the elucidation of the problem, will be as satisfactory from the standpoint of science, as they will undoubtedly be in the preservation of the life and health of the community.

POSTSCRIPT.

Some new facts of interest and importance have appeared since the completion of these papers. The Danish Government, impressed with the value of tuberculin as a means of diagnosis, and therefore of prevention of the spread of Cattle Tuberculosis, has presented a bill to the Folksting, which has passed the first reading, allocating an annual grant of 50,000 kroner, to defray the expense of an exhaustive series of experiments with this agent.

The latest Report of the Veterinary Department of the Board of Agriculture, which has just been issued, gives details of an investigation of the infective action of tuberculous meat. Rabbits and guinea-pigs were fed on raw meat from the carcasses of tuberculous cattle, *care being taken that it was perfectly free from the tubercle bacilli*, as the infectivity of actual tubercle is regarded as fully established and universally admitted. The meat was removed with about the same amount of precaution as would be employed by a butcher in the course of his trade; and of 13 animals fed on it, 9 were afterwards demonstrated to have become infected with tuberculosis. In a second series of 9 guinea-pigs similarly fed, all contracted the malady. Grave as are these results as to the danger of eating meat, apparently

healthy, because free from the tubercle bacillus, they are rendered more serious by the outcome of another series of experiments which shewed that this meat (still free from bacilli), when cooked in the ordinary way, caused infection in the animals fed upon it, though, when cut into very thin slices and thoroughly cooked through, no infection followed. But Professor Brown, the author of the Report, adds that such cooking could not be applied to joints of meat without entirely destroying their flavor. It would be difficult to adduce stronger evidence of the necessity for a stringent examination of all animals intended for human food.



