

Tuberculosis
in Man and the Lower Animals.

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by

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Preface -

In the Thesis hereby humbly Submitted for the approval of the Senate of my Alma Mater, I have endeavoured to treat the Subject of Tuberculosis from the Stand point of a Medical Officer of Health, and have therefore not entered into Diagnosis or Symptoms of the disease. My chief aim has all along been to show the communicable Nature of Tuberculosis between man and the bovine race, with the effects resulting from such communication.

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1.
"Microparasites in Disease". New Sydenham
Society 1886.
The Etiology of Tuberculosis, by Dr. R. Koch.
Translated by Stanley Boyd, F.R.C.S.
Page 135.

Tuberculosis.

What is Tuberculosis? We can now answer this question with confidence; - it is a disease caused by the presence of the Tubercle Bacillus, through which it produces an injurious effect on the tissues in which it takes up its abode, so long as it continues to live and multiply.

The term Tuberculosis, includes many forms of illness which were formerly looked upon as separate diseases. We now know that Phthisis Pulmonalis, Tuberculosis Mesenterica, Tubercular Meningitis and all the other forms of tubercular affections of the glands, bones, joints, serous membranes or owe their origin and destructive tendencies to the presence of this microscopic organism, which has remained for ages undetected, till some fifteen years ago after untiring perseverance and research, Dr. Robert Koch proclaimed to the world that "The conclusion may be drawn with great probability that the tubercle-bacillus is not a chance accompany-

3.
"The Etiology of Tuberculosis," by Dr. R. Koch.
page 200.

ment of tuberculosis, but stands in the position of the direct cause of the disease, and from these three facts, viz., that tubercle-bacilli are always present in tuberculosis and occur nowhere else, that they precede, both as to place and time, all the peculiar pathological changes, and that their number, appearance and disappearance are in direct relation with the course of the disease".

He cannot help admiring the unselfishness of this man after making such a discovery, that he would seek to lessen the glory attaching to his own indomitable perseverance by minimising his own labours and magnifying those of Cohnheim. Koch writes, The etiology of tuberculosis as here developed on the basis of our knowledge of the tubercle-bacillus offers in detail hardly anything new. Cohnheim had already recognised tuberculosis as an infective disease before the tubercle-bacillus was discovered, and had accordingly sketched out its etiology. Science has, therefore, made no material advance in this direction through

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my researches; but it must be regarded as a gain that on the highly important point of the infectious nature of tuberculosis, which up to that time was still disputed by most people, proof should have been brought forward which shuts out any further valid objections."

Ever since the etiology of this disease was so fully established, some eighteen years ago, the subject of tuberculosis has caused an unbounded interest, not alone in the ranks of the Medical profession, but also to all interested in the well being of the whole animal race; for this disease does not confine its ravages to the human race, but also obtains entrance and continues its destructive action amongst our domestic animals both of the four footed kind, and our bipeds of the feathered tribes - But also, not even our animals in a wild state of nature can claim immunity from this scourge if once the evil influence of this bacillus manifests its presence among them.

7
"The Etiology of Tuberculosis"
by Dr. R. Koch. page 68.

According to Koch, the first endeavours to prove that human and bovine tuberculosis were the same disease is due to Klencke" who in the year 1843 succeeded in inducing an extensive tuberculosis of the lungs and liver in rabbits, by inoculation with portions of miliary and infiltrating tubercles from man; and he did this by the introduction of these masses into the veins of the neck. He did not continue his researches, and they were consequently soon forgotten. In the meantime Villemin undertook an experimental investigation into the nature of tuberculosis, working in a methodical and thorough manner. He inoculated not only with tubercular material from human beings, but also from cases of bovine tuberculosis, and proved experimentally the identity of the latter disease with human tuberculosis." Although human and bovine tuberculosis have thus been shown to be intercommunicable, the same cannot so definitely be said regarding Avian tuberculosis.

9.
Professor Muir's Lectures on Bacteriology.

Dumfries 1899.

"The Animal Tuberculoses" &c. by Ed. Rocard.

Translated by H. Sewfield, M.D. 1895.

pages 137 and 138.

When "cultured" the Avian grows at a higher temperature than that in Mammalia. Besides it is very difficult to inject the guinea pig with avian tubercle, and very difficult to inject the bird with animal tubercle. Noeard says, One does not usually succeed in transmitting to fowls the tuberculosis of man or the mammalia, either by inoculation or by ingestion. Straus and Wurty made six fowls eat formidable quantities of the sputa of consumptives, and none of them became tuberculous. Rivolta, Mafucci, Straus, Gamaleia, and most experimenters, have failed to transmit tuberculosis of mammalia to birds. On the other hand, Cadot, Gilbert & Roger, Courmont & Dor, and Noeard, have shown that the inoculation of the tuberculosis of the mammalia into fowls is sometimes successful, and that this tuberculosis can then be transmitted by inoculation from one fowl to another. A most interesting and instructive account of the transmission of human tuberculosis to fowls, and thereafter the transmission of tuberculosis from the fowls to the

11.
"Report of the Departmental Committee
appointed to inquire into
Pleuro-Pneumonia and Tuberculosis
in the United Kingdom -" 1888.

Page 256. Answers 8048 and 8049.

human subject, was quoted by Mr. Alfred Lingard, M.P., in his evidence before the Committee in 1888; it is a translation from the account published by Dr. Lamallerie in "Gazette Medicale" of the 15th of August 1886. He describes how a Soldier - suffering from tuberculosis - after serving in the Franco-Prussian war, came to reside in a village, 1500 feet in elevation, where for years and years no one had died except from old age. This soldier married a healthy woman, who also afterwards became tuberculous, and they both died. While the wife however was ill, a second woman in quite another part of the village became ill with tuberculosis. On making enquiries Dr. Lamallerie found this woman had been getting dead fowls from the soldier's house, and on going to this latter house to trace this connection, he heard the poor woman coughing and expectorating, and found the fowls chasing one another hurry-scurrying as hard as they could into the house and fighting with one another for the expectoration. The fowls were killed and examined and found with extensive tuberculosis, and

13.
"On the Prevention of Consumption".
Report by the Health Committee of
the City of Edinburgh. to the
Magistrates and Town Council.

1900 - (page 54.)

this poor woman who had eaten ten or twelve of these fowls within three months, had unfortunately partaken of them after very slight cooking, as she "was told by everybody that the bleeding flesh of fowls is the best way of gaining strength to overthrow the bronchial attack".

In an article on "The prevention of tuberculosis as regards food" by Professor Virchow read at the "Berlin Congress on Tuberculosis" in 1899, he says: "On the other hand, on the strength of the very exact and repeated examinations made of late years, especially by the Parisian bacteriologists, I am of opinion that the danger of taking tuberculosis from poultry is very slight. We sometimes read in the papers that a family has been infected here or there by a parrot or some other bird. It has, however, been ascertained that, although tuberculosis does occur in birds - it is even occasionally present in our domestic fowls - yet it is a different species of bacillus, we find, one that, if carried over, does not produce tuberculosis

15.
Report of Royal Commission on Tuberculosis.
Part. II. 1898. (Page 108, answer 2421.)

Report of Royal Commission on Tuberculosis.
Part. I. 1898. Page 2. Paragraph 11.

Report of Royal Commission on Tuberculosis.
Part. I. 1895. Page 10. Paragraph 23.

again, but disorders which are not the right-tuberculous disease. This may therefore be overlooked. I do not think that any special restrictions need be laid on poultry - dealing on this account.

With such a diversity of opinion as to the unity and intercommunicability of the mammalian and avian tuberculososes, it is fortunate, that our domestic fowls to be edible, must be thoroughly cooked, and - even admitting that such communicability of infection does exist - hence all danger to man in their ingestion is practically nil.

With Bovine tuberculosis however, it is quite different, for according to the Report of the Second Royal Commission on Tuberculosis, the Commissioners state, "We have had before us the unanimous finding of the Royal Commission on Tuberculosis which reported in 1895, to the effect that tuberculous disease in bovine and other animals is identical with that in the human subject, and that it is communicable from one to the other, though the manifestation of the disease differs in some respects. In 1897, ~~and~~

17
"The Animal Tuberculosos" by Howard.
Introduction. Page V.

Watson's Lectures on the Principles and
Practice of Physic, 1871. Vol. I. Sect. XII.

in the human subject from that in the lower animals. We have also considered their finding, that "any person who takes tuberculous matter into the body as food incurs risk of acquiring tuberculous disease." Nothing that has come before us in the course of our inquiry has raised any doubt in our minds as to the accuracy of this opinion. At the same time, we think that there has been a tendency in some minds to exaggerate the extent of the risk arising from meat."

Having thus seen how intimate the connection between man and the bovine race is as regards tuberculosis, it will be my endeavour in this thesis to consider the subject in this dual relationship.

History.

Columella, a writer of the first century, a native of Cadiz, writes in his best known work, "De Re Rustica", of a disease in cattle which Rozard declares to have been tuberculosis, in this article he refers to ulceration of the lungs as its last stage.

The general belief - Sir Tho. Watson writes in 1871 - is that tubercular diseases are not contagious, i.e.,

Watson's Practice of Physic 5.
Vol. I. Lecture XLII.
and Vol. II. Lecture XLIX.

"capable of being communicated from one individual to another. Indeed their very dependence upon a peculiar diathesis would seem to disprove the supposition".

"Yet," he adds, "Some practitioners, even here, have, I know, misgivings on the subject"; and in some parts of the Continent, in Italy particularly, Consumption patients are shunned, from the persuasion that their complaint is infectious". He then adds, "Are these tendencies to disease - these diatheses inherited? That they are so can scarcely be doubted; and being so, the diseases which spring out of them must also be counted as hereditary".

As to the Pathology of tuberculosis, up to well on past the middle of the century now coming to a close, the view held by Sir R. Carswell was generally accepted. He held that tubercular matter was deposited from the blood, and that its favourite site was on the free surface of mucous membranes, and not in the areolar tissue as was formerly believed. Once deposited, the tubercular matter was liable to increase not by any outgrowth, but by additional

deposits on its surface. Laennec, Andral and Rothemann, had each their own views regarding the nature of this tubercular deposit. Laennec's theory (which was substantially the theory of English pathologists up to the time of Villemin's discoveries were announced in 1865), was that this tubercular matter took its rise in the blood itself, was the result of some constitutional vice, or defect, or impurity of that fluid - impairing thus the healthy and perfect maintenance of the pulmonary and other tissues, that this tubercular matter had been deposited directly from the blood, and is never a consequence of pulmonary inflammation. After 1865, on the other hand, Professor Niemeyer of Tübingen advanced the new theory, in which he was supported by Ruhl, that the gray granulations which all agree to call tubercles, are derived, in the greater number of cases, if not in all, from pre-existing inflammation: this theory is exactly the reverse of that asserted by Laennec - Mr. Simon, Dr. Sanderson, and Dr. Wilson Fox did much at this time to elucidate this subject.

"Report on the Prevention of Tuberculosis"
by James H. H. M. O. H. 2nd Feb. 1899.
page. 25.

On the Prevention of Consumption
Report by Public Health Committee. 1900
Page 101 and following pages.

"The Animal Tubercloses" by Howard.
Page. 54.

From experiments in artificial tuberculation
 Dr. Tompkinson came to the conclusion that in
 "natural disease" the tissues primarily affected
 with tubercle are those which belong, not to the
 system of blood vessels but, to the lymphatic system.

In reading of the treatment of Consumptions
 and their belongings in the last century and even
 well on in the present century, we feel as if the
 measures instituted and carried out successfully
 through notification in New York (as detailed fully
 by Dr. Hiren of Manchester) of Phthisis, as being
 extremely mild in comparison with what was
 done in some Continental towns 150 years ago,
 and yet many of our leading medical men in
 the evidence detailed in the Edinburgh Report think
 that public opinion is not yet sufficiently formed
 to accept of compulsory notification of Phthisis
 with the precautionary measures which would
 ensue therefrom.

NoCARD relates that "There used to be a widely-spread
 popular belief in the contagiousness of phthisis, and

"Tuberculosis, its Nature, Prevention, and
Treatment" by Alfred Hillier, M.D. 1900.
page -4.

in some countries the consumptives were isolated (as lepers were in the middle ages), and after their death their clothes were burned, and the houses they had occupied were either burnt or carefully disinfected. In 1750 the magistrates of Nancy caused to be burnt the belongings of a woman dead of phthisis.

At Naples, a royal decree, dated Sept. 20^e, 1782, ordered the isolation of consumptives and the disinfection of their habitations, goods, furniture, &c. under a penalty of 3 years at the galleys for common persons, and 3 years imprisonment and a fine of 300 ducats for nobles. The doctor who failed to notify a case of consumption was liable to a fine of 300 ducats for the first offence, and to banishment for ten years for the second; and anyone who aided the escape of a consumptive was condemned to six months imprisonment.

Both Howard and Hillier relate the case in Spain in 1839 of Georges Sand travelling with Chopin, and how the doctors sent for owing to Chopin's cough, spread the news that he was

British Medical Journal. Vol. II. 1898.
page 1899.

a consumptive, and they were treated as outcasts and peculiarly plucked like chickens.

At the meeting held on 20th December 1898, at Marlborough House on "The Prevention of Tuberculosis" and presided over by H. R. H. the Prince of Wales, in proposing a resolution the Marquis of Salisbury said: - "I remember some relations of mine just after the great war who went abroad to be cured of consumption at an Italian city, and they found there the strongest provision of the law against their inhabiting any dwelling for such purposes from which the contagion might be expected to spread, and that after death those very provisions which Sir William (Broadbent) is anxious that Sanitary authorities should take here were already a matter of law and of active practice in that country. In this matter the theory of science has been ahead of us, and so it is not surprising that our practice has been a little behindhand, and now it calls on us to make redoubled efforts to level our position up with other nations."

In 1871, as

"Royal Commission on Tuberculosis":
Part II. 1898. Page 212: Questions 4806-8.

"The Etiology of Tuberculosis" by Koch. Page 68.

"The Animal Tuberculosis", by NoCARD. Page 56.

"Bacteriology". Muir & Ritchie, 1897. Page 205.

quoted at page 18, of this thesis from Sir Thomas Watson's lectures, tuberculosis was generally believed to be a hereditary disease - and now, in the year 1900, there are very few - if any - medical men who dispute the infectious nature of consumption; and although some still give heredity a certain influence in the production of phthisis, yet most will agree with Professor Brown when he says, "Then the heredity means that the animal is born more liable to have the disease if the infective germ get into it." This, he adds, "is what scientific men admit to be the case". As before stated (page 8) the credit of the change of opinion as to the causation of tuberculosis is given by Koch to Klencke, yet Howard awards the full credit to the researches of Dr. Villemin, Professor at Val de Grace, as published in 1865. These experiments of Villemin were also performed by other workers, but the results did not appear conclusive enough to give satisfaction, and the full eclat he so well deserved was not at once bestowed upon him. Much credit is given to Armanni in 1873, and to Klebs also for their labours in this matter; but Cohnheim

"Royal Commission on Tuberculosis"

Part II. 1898. Page 9.

Evidence given by Mr. Thomas Henry Elliot,
Secretary to the Board of Agriculture.

and Salomonson were to a great extent successful in establishing in the public mind the fact that tubercular materials, apparently differing widely from each other, are characterised by one and the same specific contagium. The final touch, or capstone to the building, however took place, when in ^{March} 1882, Koch conclusively proved the presence of the tubercle-bacillus to be the sine qua non of tuberculosis.

The result of this discovery has been to give a great impetus to the subject of tuberculosis in all its forms and connections, and during the last few years congresses and medical association meetings have been held in many parts of the world to discuss these.

In 1883, the Irish Government applied to the Privy Council, to have Tuberculosis placed under the Contagious Diseases (Animals) Act 1878, but nothing was done.

In 1885, the Town Council of Hull also communicated to the Board a report by their Medical Officer on the danger attending the sale of milk and flesh of tuberculous animals. In this same year the Council of the Association of Municipal Corporations forwarded

Report of the Departmental Committee on
Pleuro Pneumonia & Tuberculosis. Part I.
1888.

to the Privy Council a memorandum sent out to Medical Officers of Health as to the infectious nature of bovine tuberculosis with the reply that sixty one of these medical officers considered the disease was communicable to man by means of uncooked milk or insufficiently cooked meat. In this year the Dairies, Cowsheds, and Milkshops Order was instituted, but this did not confer the security desired. In 1886, the Yorkshire Confederation of Butcher's Associations also petitioned that Tuberculosis be included under the Contagious Diseases (Animals) Act. In 1887, the Police Commissioners of Paisley petitioned the Privy Council that the word "disease" in the Contagious Diseases (Animals) Act, be so amended as to include Tuberculosis, and although not quite successful at first, they eventually induced Lord Crombach (the President of the Council) and Lord Lathian (Secretary for Scotland) to refer the question of Tuberculosis to the Departmental Committee already appointed on "Pleuro-Pneumonia" to inquire into the nature and extent of tuberculosis in the United Kingdom, and the

"Royal Commission on Tuberculosis".
1895. Part II. page 1.

means to be adopted to arrest its progress. This Committee under the Chairman ship of Sir Jacob Wilson, gave in on 10th July 1888, a most comprehensive and suggestive report, but after due consideration the Privy Council decided to take no action in the direction proposed by the committee. In 1889, the Board of Agriculture was established, and took over the duties of the Privy Council in September 1889. In the Spring of 1890, as the result of a debate in the House of Commons on the subject of tuberculosis, and on the motion of Mr. Lewis Knowles, M.P., and a deputation jointly to the Presidents of the Board of Agriculture and the Local Government Board. This deputation led to the appointment of the Royal Commission on Tuberculosis under the Presidency of the Right Hon. the Lord Basing in 1890. (on July 21st) "To inquire and report what is the effect, if any, of food derived from tuberculous animals on human health; and, if prejudicial, what are the circumstances and conditions with regard to the Tuberculosis in the Animal which produce that effect upon Man." They also returned a very

"Report of the Royal Commission on Tuberculosis".
Part I. 1898. Page IV.

British Medical Journal, 1898: Vol. II. Page 1899.

comprehensive and satisfactory reply.

A second Royal Commission on Tuberculosis under the Presidency of Sir Herbert E. Maxwell, Bart., M.P. was appointed on 6th July 1896. "To inquire into the administrative procedures for controlling danger to man through the use of meat and milk of tuberculous animals". This Committee also reported on 14th April 1898.

The whole gain, from a legal point, that we have obtained from the prolonged evidences of this Departmental Committee and the two Royal Commissions is that the Dairies, Cowsheds, and Milkshops Order of 1885, has an additional Order of 1899, which provides that milk from a cow certified by a Veterinary Surgeon to be suffering from tubercular disease of the udder shall not be sold for human food under a penalty of five pounds Sterling.

At the end of this same year - 20th December, 1898, a private meeting was called by the Prince of Wales to meet at Marlborough House to inaugurate and further the objects of the "National Association for the Prevention of Consumption and other

"British Medical Journal". 1900. Vol. I.
page 649.

forms of Tuberculosis". The meeting was a representative one of the United Kingdom, for amongst others, Sir J. Traill Stewart - the then President of the British Medical Association, and as Professor of Medicine in Edinburgh University - represented Scotland; Dr. J. W. Moore, speaking as President of the Royal College of Physicians of Ireland, represented that part of the Kingdom, and Sir Samuel Wilks, as President of the Royal College of Physicians of London, appeared for England, and Professor M. Jackson as Principal of the Royal Veterinary College, duly represented the veterinary profession. Already this Association has done good work in disseminating information on this subject, through their journal "Tuberculosis" and otherwise. The first general meeting of members of this National Tuberculosis Association was held in London on 13th March 1900, when among other things it was announced that the Prince of Wales had agreed to preside at the National Congress on Tuberculosis to be held in London in 1901.

Tuberculin.

Having discovered that the tubercle-bacillus was the cause of Consumption, it was but natural that Koch should continue his investigations and endeavour to discover an antidote to tuberculosis. Although in one marked respect, tuberculosis differs from some other infectious diseases, as for instance Smallpox, where we find vaccination has acted so beneficially as to have immortalized the name of Jenner, and where one attack of Smallpox gives a fairly certain security against a second attack or at least considerably modifies it; we find on the contrary that an attack of tuberculosis instead of giving protection against a second attack, is liable to become a predisposing agent in inducing a recurrence of the disease if a fresh source of infection should take place. Notwithstanding this dissimilarity, after carefully observing that a healthy guinea-pig and a guinea-pig already inoculated with tuberculosis reacted very differently

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to subcutaneous inoculation of tubercle-bacilli or of dead cultures of tubercle-bacilli, Koch prepared his "Tuberculin" by inoculating with tubercle-bacilli a veal bouillon containing from four to five percent of glycerine and one percent of peptone, keeping his culture at a temperature of 38° C. for six or eight weeks, then evaporating it to about one tenth of its bulk, and killing the bacilli in it by exposure of it for an hour to a temperature of 100° C.

About the end of 1890, this discovery became known to the world as a "lymph" capable of preventing the effects of the inoculation of a tuberculous product, of healing a tuberculosis already set up if not too advanced, and of proclaiming the presence of tuberculous lesions inaccessible to other methods of diagnosis. The excitement in the medical and lay world over this reported "Cure of Consumption" was immense. Koch himself was highly honoured by his Emperor, crowds of consumptives flocked to Berlin for treatment, and medical men in scores from all

"Report of Royal Commission on Tuberculosis" 1898.
Part II. Page 62. Answer 1259. There Professor Sir Jackson
states "with tuberculin, it is practically a certainty".

Also. "Conference of Local Authorities in Scotland on the
Prevention of Tuberculosis". Glasgow. 1900.
Page 91. Paper read by Principal Dewar.

parts of the world journeyed thither also, to see these proclaimed cures, obtain instruction, and return with a supply of the curative lymph so long hoped-for in vain. Unfortunately the results of this treatment were not successful to the full extent anticipated, for in many cases - especially in advanced disease - acute phthisis was set up, even followed by a fatal issue. The disappointment to the public mind became - if possible - even greater than the previous exhilaration had been. Although as a curative agent, tuberculin had thus to be given up, still the third characteristic proclaimed by Koch has proved true, for as a diagnostic agent in cattle, in proclaiming the presence of tuberculous lesions inaccessible to other methods of diagnosis tuberculin in the hands of the veterinary surgeon has become invaluable. By its aid he is able to detect tubercular mischief in the most incipient stage and in the most obscure regions quite beyond the power of ordinary clinical investigation.

47.

The Animal Tuberculosis by Nicard. page 50.

to discover. An injection of tuberculin in a rightly-proportioned dose, produces in tuberculous cattle a rise of temperature of about 2° in fifteen to eighteen hours. Of course for two or three days before injection, the temperature must be taken to avoid a false diagnosis, for in cattle, gastric disorders readily increase the temperature above 100°F at which we generally find the normal cattle temperature, for notwithstanding the effect of gastric disorders, it is admitted that cattle suffering from tuberculosis have a normal temperature. It is the opinion of the different scientists in veterinary matters who gave evidence before the Royal Commission on Tuberculosis that in Tuberculin we have an infallible test for tuberculosis, and I hope it will yet become so universal in its application that milk will not be allowed to be used in the nursery, unless the cow from which it has been obtained has not reacted to tuberculin, nor shows evidence otherwise of tuberculosis.

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Although disappointment has partly been the reward of the labours of 1890, yet Koch has not ceased to experiment on similar but improved lines, and in 1897 he published the result of his efforts to obtain a cure for consumption, with tritiated dried cultures of bacilli which after due elaboration he has called "Tuberkulin Oberst" and "Tuberkulin Rest", or for brevity "T. O." and "T. R." With these agents he is still experimenting, and so far, at least as regards Dupus, with apparent success.

Prevalence and Death rate.

The Registration of Deaths gives but a very faint idea of the amount of sickness prevailing generally; it is silent also on the amount of loss to the community owing to the disablement to work. Of no disease is this statement more true than of Phthisis Pulmonalis, as the weary sufferer often lingers out a weary existence of two or three years, perhaps in reduced circumstances and with general surroundings compatible with a diminished house rent. On several occasions

"Vital Statistics" by A. Newsholme. 1899. Page 38.

"Vital Statistics". Page 150.

attempts have been made to obtain satisfactory statistics on this point. Newsholme refers to the first attempt at such a purpose in 1857, and another in 1860. Dr. Lyon Playfair in 1874, emphasized the importance of registration of sickness in these words:—"The record of deaths only registers, as it were, the wrecks which strew the shore, but it gives no account of the vessels which were tossed in the billows of sickness, strained and maimed as they often are by the effects of recurrent storms. Registration of sickness would tell us of the coming storms, and enable us to trim our vessels to meet them". On this point Newsholme says, we shall probably be well within the mark if we assume that for every fatal case of illness there are from four to five more cases which end in recovery. This is about the proportion in Enteric fever, which is a more fatal disease than the average of diseases." We must therefore with such a prolonged period of sickness as we have in Consumption, to attain to a fair average of the amount generally present, multiply our deaths by a much

See page 55. where according to key den it is nearly "Seven".

Royal Commission on Tuberculosis.
Part II. 1895. Page 7. Answer 208.

Report to the Board of Supervision on Tuberculosis.
30th March 1888.

Departmental Committee on Pleuro-Pneumonia
and Tuberculosis; 1888: Part II. Appendix. Page 315.

larger (multiple than even "fire". We can corroborate this statement by one or two references to cases of healed phthisis where death occurred from another cause. "D. Harris, Assistant in the Pathological Department of the Manchester Royal Infirmary, has made an analysis of the proportion of healed phthisis found in persons that have died from other diseases, and this proportion reaches a very high degree with advancing age, so that of persons who die between 60, and 70, the proportion is something like 80, or 90. %.

Sir Henry Dittiejohn Sarg, "I hardly ever open a body of a person dying from an injury or disease, but traces of the previous existence of tubercle in the lungs are found, and it is apparent that this disease has been arrested and a cure effected."

Although, since 1879, district and workhouse medical officers and medical officers of district schools, notify all the cases of sickness and death occurring under their charge, yet it is only in the Army and Navy that we have a complete weekly record of sickness - its character, duration and result, - given to us

See City of Edinburgh "Report on Tuberculosis" page 11.

"Professor E. von Leyden of Berlin reckons that as in Germany there are at least 180,000 persons dying annually from Consumption of the lungs, there cannot at the present moment be fewer than 1,200,000 persons suffering from consumption in greater or less degree within the German Empire alone."

Registrar General's Monthly Returns of
Births, Deaths and Marriages.

for our information. We certainly have the notification of sickness due to an industrial cause - as lead poisoning &c. - and in Scotland every where the Infectious diseases Notification Act, it would still be an enormous encouragement in the department of preventive medicine if we had a complete system of notification of - at least - all infectious diseases; and in this class I would assign the foremost place to tubercular diseases. Although we cannot therefore obtain an accurate estimate of the prevalence of Consumption, still much information is obtained by comparing the death rate with that of the Zymotic and infectious notification cases. and the total deaths from all causes. For this purpose I have tabulated all the deaths registered in the five years - 1895-1899 - and by dividing the total numbers by five, have struck a fair average of the deaths per annum occurring in Glasgow, Edinburgh, Dundee and Perth.

I must however state that, in particular, measles and Whooping were at times very much above the average. In the Spring of 1898 Measles was double, in the Spring of 1897 it was two and a half times, and in December 1896 it was four times the average, in Glasgow.

In Edinburgh also in March, April, May and June 1897 the deaths from Measles were five times the average. And in Dundee owing to a severe epidemic in May, June, July, and Augt. 1898, Measles showed a death-rate five times the average of the five years.

Whooping again - by far the most fatal of all the infantile diseases of the Zymotic class - does not vary in its average so much as Measles during these years, still in February, March, and April 1897 it was double and from Dec: 1895 to June 1896 it was in Glasgow one and a quarter times the average. In Edinburgh in January, February and March 1899 it was, as also during the first seven months of 1897,

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Dr. Ballard's observations, published in 1887.
"Hygiene and Public Health," by Louis C. Parkes,
1895. Page 457.

three times the average. In Dundee in the Spring of 1899 it was double the average as also in the Summer of 1898, the Autumn of 1897, and the Spring and Autumn of 1895; whereas in January 1896 it was four times the average. In Perth it was four times the average during the first half of 1897.

On the other hand, *Tuberculosis* varies slightly in amount, but during these five years in these four cities *Phthisis* scarcely varies at all. But month by month claims its full pound of flesh like a veritable Shylock.

It will be seen from this table that the death-rate from *Phthisis* alone is more than three times the death-rate of all the notifiable infectious diseases together; while combined with the deaths from *Tuberculosis* it is nearly equal to all the zymotic diseases put together. *Diarrhoea* - which is entirely a seasonal disease, depending on the rise and fall of the four foot-ground temperature - then these two tubercular diseases

Zymotic diseases. (Deaths.)
Yearly average of the five years, 1895-1899.

<u>Disease.</u>	<u>Glasgow.</u>	<u>Edinburgh.</u>	<u>Dunfer.</u>	<u>Perth.</u>
Smallpox	6.0	3.2	-	-
Measles.	560.2	171.8	53.6	6.0
Scarlet Fever.	168.2	73.6	25.2	5.6
Diphtheria.	100.2	53.0	27.2	5.0
Whooping cough.	633.0	143.8	82.6	11.4
Fever, (Enteric & Typhus.)	174.8	44.2	22.8	5.4
Diarrhoea.	452.2	139.2	141.0	17.2
<u>Totals.</u>	<u>2094.6</u>	<u>628.8</u>	<u>352.4</u>	<u>50.6</u>
Reduct: Diarrhoea	1642.4	489.6	211.4	33.4
Deaths from all causes	15509.0	5647.8	3306.8	622.2.
Yearly average 1895-9.				
Phthisis Pulmonalis	1438.0	542.4	357.0	60.8
Tuberc Mesenterica	210.8	63.4	46.8	9.0
Phthisis & Tuberc combined.	1648.8	605.8	403.8	69.8

would outnumber the combined remaining members of the Zymotic class.

Infectious diseases. (Deaths.)

Scheduled under Infectious diseases Notification Act.

Yearly average of the five years, 1895-1899.

<u>disease.</u>	<u>Glasgow.</u>	<u>Edinburgh.</u>	<u>Dundee.</u>	<u>Perth.</u>
Smallpox.	6.0	3.2	—	—
Diphtheria.	100.2	53.0	27.2	5.0
Erysipelas.	37.0	10.8	8.4	2.6
Scarlet fever.	168.2	73.6	25.2	5.6
Fever. (Enteric & Typhus.)	174.8	44.2	22.8	5.4
Puerperal fever.	3.9	0.75	0.75	0.13
	490.1	185.25	84.35	18.73

I have not included in the above table the other diseases included under the Infectious diseases Notification Act; for thanks to Sanitation Cholera is practically unknown within our island home; Membranous Group has found its true place under Diphtheria; Continued fever has thanks to correct diagnosis been classed as Enteric or Typhus; and Relapsing fever need not be taken into account.

63.
"Royal Commission on Tuberculosis" Part II. 1898.

Page 150 - Answer 3418.

"The Prevention of Tuberculosis"
Meeting at Marlborough House.

British Medical Journal. Vol. II. 1898. Page 1899.

It is admitted that tuberculosis is alone responsible for not less than one seventh of the whole death-rate of the world. In the table given at page 61, it will be seen that Phthisis Pulmonalis and Tabes Mesenterica combined are responsible in these cities for one tenth of the death-rate from all causes. Dr. Chalmers, Medical Officer of Health, Glasgow, in his evidence gives the proportion of deaths in one hundred tubercular deaths, due to the different forms of Tuberculosis in the City of Glasgow: -

Phthisis Pulmonalis	72
Tabes Mesenterica	9
Tubercular Meningitis	11
Other forms of Tuberculosis	8
	<hr/>
	100.
	<hr/>

This shows that if we calculate all the tubercular deaths in Glasgow, they would, at least, equal the deaths from all the zymotic diseases - diarrhoea included.

There has been a marked decrease in the tubercular death-rate during the last thirty years, and although - as Sir William Broadbent says there is an exception to this statement in regard to Tabes Mesenterica -

"Vital Statistics": A. Newsholme, 1899. Page 151.

"The Prevention of Consumption." Edinburgh Report:
1900. page 83.

it is yet interesting to note, that about this time (1874.) "The Births and Deaths Registration Act" was passed, thus changing the certification of the cause of death from being optional to be the compulsory duty of the Medical attendant (unfortunately an unpaid duty), so that we now have more confidence in accepting the Registrar's returns as being more complete. Synchronous with this fall in the tubercular death rate we have the passing of the "Public Health Acts" of 1872 and 1875. Sanitation besides reducing the general death rate from all causes, must be credited with the satisfactory tubercular diminution among females - even more so than among males: - for while before 1870 the female phthisis death-rate exceeded the males, in 1896 the proportion was for males 1.48, and females 1.14 per 1000 deaths, for this we have to thank drier dwellings, more thorough ventilation, and in short, more healthy homes. This fact may also be observed, from enquiries made as to the houses where deaths from phthisis occurred in Edinburgh, out of 533 deaths in houses at all rents, there were 198 in houses from £5 to £10, and 114 in houses from £10 to £15.

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"Report of Departmental Committee on Pleuro-Pneumonia
and Tuberculosis" Part I. page 77. 1888.

These small rented houses are notoriously those which are old and quite deficient of all Sanitary improvements.

Although at one time, consumption was spoken of as the English disease, its ravages are now confined to no one part of the globe, for wherever people Congregate most, if the disease is once imported, there it spreads. In Labrador it is said to be unknown, and yet when the natives of that northern region come south to the shores of the S. Lawrence, they fall victims readily to this fell disease, while in New Zealand at the southern end of our world, phthisis has well nigh exterminated the Maori race. Although New York is grappling so nobly with this fiend, yet in the States of America the black race is rapidly disappearing off the face of the earth owing to the spread of consumption. In India, China, and Japan this disease is most virulent and rapidly fatal.

Tuberculosis is not found to be equally prevalent among the lower animals, the order of its frequency - after man, who unfortunately heads the list, - comes cattle, then fowls, rodents, pigs, goats, sheep, horses, dogs, cats &c. Were all these lower animals however

"Meat-Inspection". (A. Practical Guide to) 1896.
By Thomas Walley, M.R.C.V.S. Page 136.

"Board of Agriculture Returns" for 1900.

"The Prevention of Tuberculosis"
Meeting at Marlborough House.
British Medical Journal, 1898, Vol. II. Page 1902.
For detailed report, see
"British Medical Journal" 1899, Vol. I
22nd April 1899. Page 986.

confined in byres in a similar manner to how cows are kept in towns, (where in many cases the chief consideration is how best to convert them into "milking machines") and were the tubercle bacillus introduced among them, I am convinced the distribution of this disease would be almost as great among them all.

Confining ourselves, in the meantime, to our principal "food animal", we find in 1899, while the population of the United Kingdom is returned as 36,024,438 souls, the bovine population amounts to 2,671,000 milk cows, and 4,125,000 of other cattle. Besides this, we imported in 1899, 503,504 cattle, and 846,000 tons of dead meat either in a fresh or frozen state. This disease is not confined to our shores, but is also prevalent on the Continent of Europe, America &c. Neither is it found alone among the cattle of the poor, for in 1898, The Prince of Wales stated, "I have been informed that Her Majesty the Queen gave authority that 36 of her dairy cows at her Home farm, which, on being tested by tuberculin were found tuberculous, were to be destroyed". We have no accurate information as to the prevalence of tuberculosis

"Royal Commission on Tuberculosis" 1898.
Part II. Page 188 - Answer 4749.

"Royal Commission on Tuberculosis" 1895.
Part II. Page 76. Answer 1509.

"Royal Commission on Tuberculosis" 1898.
Part II. Page 83. Answer 1817.

"The Animal Tubercloses" by Nocard. Page 66.

in our country, although there is a general opinion that it is more prevalent in the female sex; although this statement is not necessarily correct, as we shall endeavour to show; - it yet is true that it is more prevalent amongst our cows; on this point, B. Reuscholme, M.O.H., Brighton, states, "From September 1889 to November 1896, 68 tuberculous heats were condemned, and of these, 53, or about 80 % were cows." Sir H. D. Littlejohn also states: - "In our establishments it has been a very rare thing to find a dairy cow without exhibiting a trace of tuberculosis, and I have no doubt that that is the general condition of the dairy cows of the country". Among bullocks, on the other hand, Mr. Haydon (the President of the London Butchers' Trade Association) gives the proportion of tuberculosis in England and Wales as 5 per cent. Among calves, tuberculosis is practically unknown.

There was also a general expression of opinion in the evidence given before the 1898 Royal Commission on Tuberculosis, that this disease was almost endemic among certain breeds, such as the Shorthorns, Ayrshires, and Jersey breed, and that among other breeds such as

Royal Commission on Tuberculosis. 1898.
Part. I. page 6. Paragraph 18.

"Report of Departmental Committee on Pleuro-Pneumonia
and Tuberculosis". Part. I 1888 - Page xxii, Par. 46.

the Welsh, Hereford, and Highland cattle, the disease was practically unknown - the former are the principal dairy breeds in our country, and kept much confined in byres, whereas our Highland cows are almost as free as the hills on which they love to roam: and in Jersey, the native cattle are reported to be wholly free from tuberculosis.

It is the frankly expressed opinion of the Royal Commissioners that neither sex, breed, nor race, has any inherent liability in the production of tuberculosis. This disease is conveyed to man chiefly by expectoration, but milk and meat are also considered to have a considerable influence on its transmission from animals to man. The Departmental Committee on Pleuro-Pneumonia and Tuberculosis, in their report state, "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 tubercular animal being used for food under any circumstances, either for man or the lower animals". It is not to be wondered at, that after such a strong expression of opinion, the inspection of meat became much more stringent.

"Report of Royal Commissioners on Tuberculosis"

Part I. Paragraph 2. pag 21. 1895.

Further Report by Professor G. J. Brown, C.B.

Do Do Paragraph 3. Do

Unfortunately, that inspection was not uniform, for in some places like Edinburgh, Sheffield, Belfast &c. the inspection was very thorough, and in some other places - as in Holborn - it was practically a dead letter.

As the expense of the condemned carcasses fell on the butchers, and as they maintained they bought animals to all appearance healthy, a great outcry as to the injustice of this inspection became universal. For although the Departmental Committee on Pleuro. Pneumonia and Tuberculosis had reported, "that in their opinion, tuberculosis should be included in the diseases in the Contagious Diseases (Animals) Act, for the purposes of slaughter and compensation for the seizure and slaughter of diseased animals exposed in markets or fairs"; the Privy Council did not adopt their recommendations; as I am convinced should have been adopted - and the reasons assigned were chiefly the amount of compensation required for pedigree cattle, and the improbability of the disease being finally extinguished. Unless there was a complete alteration in the

present system of housing - chiefly - dairy cows
 notwithstanding the existence of the Dairies, Cow-
 -sheds, and Milkshops Order of 1885, and unless a
 thorough system of disinfection of all byres from
 which tuberculous animals had been removed
 also took place, the disease would be as prevalent
 again in a few years, and all the money that
 had thus been spent on compensation would have
 been to no good purpose. There was however no
 cause to prevent this disinfection having been done.

As the butchers found they were thwarted in having
 tuberculosis scheduled as they had petitioned
 - already referred to at pages 32, 33 -, and as the
 Departmental Committee recommended should
 be done, they brought the matter prominently under
 the Government by a large and representative
 deputation being sent to the President of the
 Local Government Board and the President of
 the Board of Agriculture, to urge that some com-
 -pensation should be granted to butchers for the expense
 they had to bear owing to the confiscation of tuberculous

Professor Brown's Further Report: Page 22. Par. 9.
1895 Royal Commission Report. Part. I.

"The Animal Tuberculozes" by Howard.
1895. Page 83.

animals which they had purchased in all good faith. The Royal Commission appointed in consequence of this deputation of April 1890, were confined in their enquiry "to the effect, if any, of food derived from tuberculous animals on human health, and the circumstances and conditions with regard to the tuberculosis in the animal which produced that effect upon man". The Commission received evidence from experts on the question at issue, and also sent a circular letter to the Medical Officers of Health throughout the country. But although they thus obtained much information, could not get any definite evidence. There were records of cases from the ingestion of milk, as that interesting case given by Rodard which he borrowed from Dydlein of Karlsruhe, where a healthy boy had died as the result of drinking milk direct from a tuberculous cow, and four similar cases published by Dr. Demme of Berne, where every other possible source of infection was known to be excluded, save the drinking of raw milk from tuberculous cows. These are in 1882 and 1883.

Report of Royal Commission on Tuberculosis
1895. Part. I. Page 9. Paragraph 11.

Do. Page 20. Paragraphs. 81. 82 and 83.

The Commission therefore decided to institute experimental research, and appointed (1) Professor M. Fadycau to enquire into the means of recognising tuberculosis in animals during life; (2) Dr. Sidney-Martin to enquire as to the influence upon lower animals of food of tuberculous origin; and (3) Dr. Sims Woodhead to enquire as to the effect of cooking processes upon food from tuberculous animals. On 3rd April 1895, the Report gives the answers derived as the result of these experiments.

(1) The recognition of tuberculous disease during the life of an animal is not wholly unattended with difficulty; happily, however, it can, in most cases, be detected with certainty in the udders of milk cows. (2) Provided every part that is the seat of tuberculous matter be avoided and destroyed, and provided care be taken to save from contamination by such matter the actual meat substance of a tuberculous animal, a great deal of meat from animals affected by tuberculosis may be eaten without risk to the

A Practical Guide to Meat Inspection, 1896.
by Thomas Walley, M. R. C. V. S., Page 141.

consumer. (3) Ordinary processes of cooking applied to meat which has got contaminated on its surface are probably sufficient to destroy the harmful quality; they would not avail to render wholesome any piece of meat that contained tuberculous matter in its deeper parts; in regard to milk we are aware of the preference by English people for drinking cows' milk raw, a practice attended by danger, on account of possible contamination by pathogenic organisms; the boiling of milk, even for a moment, would probably be sufficient to remove the very dangerous quality of tuberculous milk".

It will be observed that, in these answers no reference is made to the danger of infection from the use of the Offal of tuberculous animals although, according to Waller and other writers, next to the lymphatic glands in their frequency in being the seat of tuberculous disease, comes the peritoneum, the pleura, and the internal organs, the lungs, liver, kidneys and the brain.

85.

The subject of meat inspection practically divides itself into two sections - the Meat Inspector and the Slaughter-house. As regards the Meat inspector we read that on the Continent he has to undergo a thorough preparatory course of instruction, and thereafter pass a satisfactory examination before appointment. In our country this matter has not been attended to in the same way at all; from a Return presented to the House of Commons in 1896, we learn something of the previous vocations of those appointed to act in this important capacity. In Battersea, for instance, four plumbers and three carpenters discharge the office of Meat inspector; in Hackney, the duties have been committed to two plumbers, one Carpenter, one Compositor, one bricklayer, one florist, one builder, one Surveyor, and one Stonemason; in Portsmouth, a solitary butcher has received as colleagues, three School teachers, one Medical dispenser, one Carpenter, and one tram-car conductor. It is not to be wondered at that men with such heterogeneous antecedents should be quite unfit to give satisfactory uniformity in the

"Royal Commission on Tuberculosis" 1898.
Part II. Answers 1331. Page 65.

Public Health Scotland Act, 1897. Sect. 33.

Royal Commission on Tuberculosis 1898.
Part II. Answers 5840. Page 251.

inspection of the meat passing through their hands. It was stated by Professor McFadyen in his Evidence, that Veterinary Students have now to undergo a training in meat inspection, and that this matter is one of the subjects of examination passed prior to the receipt of the diploma. We should think therefore the time has now come, that no one should be appointed to this important office unless he has undergone a training in veterinary medical science.

In Scotland, the matter of Slaughter-houses is placed on a more satisfactory basis than it is in any other part of the United Kingdom. For according to law all Slaughter houses must be annually licensed, and in any Burgh where the Commissioners provide a Public Slaughter house, none other may be used. In the smaller towns however, where this provision has not been made, there is still great need of improvement. In England and Ireland any butcher can have his Slaughter house in his backyard if he so wishes, and even although there is a public Slaughter house in the same town, he can still continue using his private institution.

Royal Commission Report on Tuberculosis 1898.
Part II Answer 2087. Page 94

Do Do Answers 2113, 2114. Page 95.

Do Do - 2093. Page 95.

The inspection of meat under such conditions would require a complete army of inspectors to give adequate protection to the public, as each butcher can kill when and where he likes, and if he be an unscrupulous man, he can dispose of the offal, even although each portion of it is a mass of tuberculous disease. Of course if the ribs have been "stripped" for the removal of the lungs, and if the inspector should "look in," this may be detected, but with such a paucity of inspectors and such a number of shops to be inspected, for one such case discovered twenty may pass undetected. Things will not be right, until all private slaughter-houses are abolished, and everywhere properly trained meat inspectors appointed in sufficient numbers to be able to inspect all carcasses killed in each district.

Our foreign cattle, which are landed at Stated ports around the coast, Birkenhead, Deptford &c., have to be killed within ten days of their arrival - exclusive of the day they land - and at Birkenhead the great centre for the foreign transatlantic meat trade, and at Deptford

91.

"Report of Royal Commission on Tuberculosis"
1898. Part II. Page 188. Answers 4241.

where Mr. S. G. Holmans states the average weekly number of cattle landed is 2600, we find the carcasses are hung up in well-lighted cooling chambers, where inspection is easily accomplished, but the offal is invariably removed from the carcass before inspection has taken place; it is however stated by Mr. Holmans that ^{it} is exceedingly rare to trace tuberculosis in the carcasses of these foreign animals.

Our dead meat trade, of which we import so many thousand tons, is also wonderfully free from tuberculosis. According to a most intelligent observer, - Dr. A. Newsholme - who states, "I have frequently examined the glands remaining in frozen meat with a view to the detection of tuberculosis, and I have never detected it. I have also frequently examined the meat with the view of finding stripping of the pleura and other indications of possible tuberculosis, and I have never once detected it." The "offal" is never imported along with the carcasses, but disposed of otherwise at the port of exportation -

"The Animal Tuberculosis" by Howard. Page 107.

"Report of Royal Commission on Tuberculosis" 1898.
Part II. Page 328. Answer 7950.

"Bacteriology" by Muir & Ritchie, 1897, Page 208.

Tuberculosis in the pig is not nearly so prevalent as in the bovine race. We shall afterwards refer to the subject of its causation- Regarding its frequency of occurrence as stated by Howard; - In Saxony in 1891, there were slaughtered in the abattoirs under inspection, 54,444. Adult cattle of which 9,476 or 17.4 percent. were tuberculous, and 230,808 pigs, of which 2,477, or 1.07 percent, were tuberculous. In the United Kingdom it is stated by Mr. Hedley F. R. C. V. S., to be very prevalent in Ireland. In the horse tuberculosis is comparatively rare; and we have already referred to its ravages among poultry. In the Sheep and goat tuberculosis is but seldom found, and this is generally attributed to their out door life, and general freedom from contamination in closely confined houses.

The dog and cat may become affected with tuberculosis, and the most elementary prudence would suggest that any dog or cat coughing or sneezing should be banished from domestic rooms, if not at once destroyed.

95
Watson's Lectures on the Principles and
Practice of Physic. Vol. I. Page 225. 1871.

"Report of Royal Commission on Tuberculosis".
1895. Part. II. Page 56. Answer 974.

Before passing on from the prevalence of tuberculosis I would refer to its action amongst wild animals. It has long been observed that although wild animals are free from tuberculosis in their native homes, that they may become subject to it if kept in captivity in close association with other animals. Sir Thomas Watson states, "The physician in ordinary to the inmates of the Zoological Gardens will tell you that the beasts and birds which are brought hither from warm latitudes perish in great numbers from Scrophulous diseases. John Hunter observed this long ago in respect of monkeys". Dr. Squire in bearing testimony to the same facts, states: - "Dr. Crisp, in the Pathological Society's transactions, says that he found tuberculosis in over 100 specimens of vertebrate animals, including mammalia, birds, and reptiles, but that he never found it in animals in a wild state, though sometimes in ~~wild~~ animals kept in the Zoological Gardens, I believe it is an undoubted fact that tuberculosis has never been found in wild animals."

Source and Channels of Infection.

We have already - at page 32 - discussed the question that the tubercle-bacillus is at all times the cause of tuberculosis, the original and only source from which all tuberculous affections spring; the consideration therefore of this minute organism, as to its natural history, is of prime importance in considering the transmission of tuberculosis from man to man, as also its connection with the whole question of human and bovine tuberculosis.

There are three principal modes or channels of infection, (1) inhalation, (2) ingestion, and (3) inoculation. The first of these is by far the most frequent source of infection in the human adult, and the one, upon which, the most earnest endeavours are now put forth to prevent or neutralise its action. When we consider that one seventh of the deaths from all causes is due to consumption, and if we add seven times this number as suffering from this disease - as suggested by Leyden, see page 55 of this thesis - we need not be surprised at the immense quantity

"Bacteria": Muir and Ritchie. 1897. Page 215.

"Microparasites in Disease" Etiology of Tuberculosis
by P. R. Koch. (New Sydenham Society. 1886) page 187.

of expectoration being thrown off from so many lungs, and this sputum often swarming with tubercle-bacilli, which can live and continue active for months at the ordinary temperature of the atmosphere - after being discharged. Considering all this, we may with full confidence admit, that inhalation of the bacillus is the most fertile source of infection of tuberculosis. The positive life of the bacillus is well illustrated in the following sentences which we quote from Koch: -

"By the force of the patient's cough particles of tenacious sputum are dislodged, discharged into the air, and so scattered to some extent. Now numerous experiments have shown that the inhalation of scattered particles of phthisical sputum causes tuberculosis with absolute certainty, not only in animals easily susceptible to the disease, but in those also which have much more power of resisting it. It is not to be supposed that Man would be an exception to this rule, but, on the contrary, we may surmise that any healthy person brought into immediate contact with a phthisical patient, and inhaling the fragments of fresh sputum

discharged into the air, may be thereby infected. But probably infection will not often take place in this way, because the particles of sputum are not small enough to remain suspended in the air for any length of time. Dried sputum, on the contrary, is much more likely to cause infection, as, owing to the negligence with which the expectoration of phthisical patients is treated, it must evidently enter the atmosphere in considerable quantity. The sputum is not only ejected directly on to the floor, there to dry up, to be pulverised and to rise again in the form of dust, but a good deal of it dries on bed-linen, articles of clothing, and especially pocket-handkerchiefs - which even the cleanliest of patients cannot help soiling with the dangerous infective material when wiping the mouth after expectoration - and also is subsequently scattered as dust. Examination of the air for bacteria capable of development has shown that they are not suspended separately in the air, but that they dry on the surface of objects, and do not enter the air until the dried mass breaks up, or unless the object on which

the dried fluid rests in itself so light as to be carried away by the slightest breath of air. Such readily distributed carriers are particles of dust, consisting of bits of vegetable fibre, animal hair, epidermis scales and such like. Hence we have to fear chiefly the soiling with phthisical sputum of materials consisting of vegetable products or animal hair, such as bed-linen, coverlets, clothes, handkerchiefs. Sputum that has dried in spittoons or on the floor gets detached only in larger pieces which do not readily float in the air. On the other hand, one can hardly imagine a more favourable contrivance for the distribution of the sputum as dust than that of allowing it to dry rapidly on stuff garments, from which at each movement fibres fly off and carry the infective material into the air, where they remain suspended for some time; and when at last they fall to the ground the particles are easily caught up again by the slightest breath of air. The examinations of air undertaken by Hesse are very instructive on this point, and confirm fully what I have just stated."

"Bacteriology". Muir & Ritchie. 1897. Page 215.

"Researches on Tuberculosis"
The Weber-Parkes Prize Essay. 1897.
By Arthur Ransome. M. D. Page 56.

The negative side as regards the natural history of the bacillus, according to Muir & Ritchie, on the other hand, is, "Five percent-Carbolic acid kills the bacilli in less than a minute; Koch and Straus found that they are rapidly killed by being exposed to the action of direct sunlight. That although when completely dried, the bacilli can resist a temperature of 100°C for an hour, yet when exposed in the moist condition to 70°C . for the same time it usually proves fatal to them. Raising the temperature to 100°C . kills the bacilli in fluids and tissues, but in the case of large masses of tissue, care must be taken that this temperature is reached throughout." We cannot do better than sum up this category of circumstances that have been found to destroy, to keep alive, or even to enhance the infective power of the bacillus of tubercle, than by quoting from Ransome; -

a) We have seen that sunlight; or even diffuse daylight; has the power of arresting the virulence of the bacillus; and that, under the healthy conditions of dry, pure subsoil, good drainage, and free

ventilation, this arrest takes place too rapidly to allow tuberculous sputum to dry up and powder into dust before it is disinfected. (b) Free ventilation alone, even in the dark, when there is no great excess of organic matter in the air, has a decisive effect in reducing this virulence. (c) But the bacillus can grow, and probably retain some of its evil power, even at ordinary temperatures, when it is kept moist with aqueous vapour containing a sufficient quantity of organic matter, derived either from the breath or from ground air. (d) When kept away from light and air, in the presence of such material as has been mentioned, the bacillus will retain its virulence for many months; and it is difficult to destroy it by ordinary disinfectants, such as, Eucalyptine or Sulphur fumigations.

Having thus fully considered the life history of this bacillus from the writings of those experienced authorities, it behoves me now to consider the channels of infection surrounding us, as above detailed.

In general infirmaries, no distinction, as a rule, is made between the spittoon used by a phthisical patient and that of any ordinary catarrhal affection. The spittoon is generally a covered vessel with a hole in the lid: the patient spits into it, and - as the expectoration of phthisis is usually so tenacious - uses the lid of the spittoon to remove the adhering sputum from his lips. If a five per cent Carbolic solution in sufficient quantity is in the bottom of the dish, the expectoration itself will be killed, but the sputum smeared on the edge of the lid is not affected. As a rule the boiling and thorough disinfection of the spittoon is entrusted to the nurse, but how easily this duty may be delegated to an ignorant wardmaid. I often shudder to think how insufficiently this is often done, as it is certainly a most nauseous undertaking, and how frequently an insufficiently cleansed spittoon is given to a non-phthisical patient. In my wards a special kind of spittoon is used for phthisical cases, and the spittoon is destroyed when the patient's

///.

residence in the hospital terminates. Seeing such a danger exists in hospitals, how much greater is the risk of infection in private practice - more especially in the houses of the poor - where the unfortunate invalid occupies as a bedroom, too often, what is the kitchen, parlour and bedroom of the establishment, and where any expectoration is voided on the floor, or if kept in a broken mug or cup is emptied "down the sink"; where the family dishes are washed, and the general ablutions of the inmates take place. Certainly, bags made of pieces of paper, which can be burned after being used would be a great boon in such single-roomed homes.

No provision in our country is made against spitting on the streets; which is such a disgusting practice, and how often, one meets the characteristic phthisical expectoration - which the donor failed even to minimize in magnitude by the free use of the sole of his boot - on the pavement, it is no great stretch of imagery to picture the lady's dress of material so accurately described as quoted from

"British Medical Journal: Vol. I. 1900 - Page 721.
(24th March 1900.)

Koch's description - getting besmeared with this
 human discharge, and thus being carefully
 carried home, and hung up in a closed up wardrobe,
 quickly to dry and in a pulverised condition ready
 to assimilate with the air of the bedroom when any
 movement of the dress again takes place. How
 different this is to the action of our American
 cousins - to whom Charles Dickens gave such a
 bad name for their promiscuous expectoration in
 public places - where a millionaire of Chicago
 was fined and a citizen of Philadelphia was im-
 -prisoned for spitting on the side walks or pavements.
 The same stringency has also been enacted in Paris
 as regards spitting on the public streets. In
 public places of amusement, the habit of spitting
 is too frequently indulged in, the sputum thus
 getting under seats and into dark corners, and
 on becoming dry, is readily introduced into the
 atmosphere during a round of pedal applause
 in some succeeding entertainment.
 How little provision is made in our poorer localities

Page 66. of this thesis.

where low-rented houses exist, such, as according to
 the Edinburgh Public Health Report, as already stated,
 phthisis is most prevalent - to have the roadway in
 good repair, for instead of finding these poor quarters
 of our large towns with "tar macadamised" streets
 where a thorough douche from the large hose pipe would
 quickly clear away all expectoration into the drain,
 we find, instead, holes and hollows interspersed
 with broken causeway stones, as if intended albeit
 to retain the expectoration, so freely scattered about,
 in such quarters, till it assumes a pulverised form,
 and thus increases the already too high, phthisis
 sick list in such localities. The dangers arising from
 phthisical expectoration are however so numerous and
 besides so protean in character, that a large volume
 could be filled in relating them without exhausting the subject.
 Ingestion is the next channel of infection to which
 reference was made, and I would first refer to meat
 infection although it is of much less magnitude than
 infection by milk. The investigations of Dr. Sidney
 Martin, and Dr. Sims Woodhead were conclusive in

"Report of Royal Commission on Tuberculosis" 1898.
Part II. Page 69 - Answer 1437.

showing that meat may convey tuberculosis, both by being itself tuberculous and by the smearing with an infected knife the surface of an otherwise healthy carcass. It is however generally admitted, that unless with "rolled meat" or very large masses of beef, such danger - owing to thorough cooking - is not very great. Of course with inefficient inspection in private slaughterhouses and unscrupulous butchers to boot, this danger to the poor - who chiefly purchase such cheap meat - is considerable. But the chief danger, I consider as regards meat, is from the "offal" which - according to Dr. W. A. Bond - includes the head, the tongue, the tail, the heart, the lungs, the liver, the spleen, tripe &c. We have already referred to the great frequency of tuberculous disease in the lungs of affected animals. Part of this "offal" which is termed in Scotland "the pluck" is "par excellence" the food of many poor families. In many parts of the country the lungs of lambs and young sheep are considered quite edible, and by many, much appreciated. Ostensibly, however, the lungs of the bovine race are not

II Knip. 4th chapt. and 41st verse.

used for human food. but with great inspection of a kind to which we have just made reference, how easy it is to have such lumps - no matter how diseased - nicely minced up and added to that omnigenous delicacy we call a "Scotch haggis", a dish made almost immortal by our National Bard, and one so essential to the gustatory requirements of our Scottish brethren. scattered wherever they may be. when they assemble to rejoice in the return of St. Andrews day. Notwithstanding all this laudation of our national dish, when we think of the proquery going on in some parts of the land, we might safely join with "the Sons of the prophets" of old saying, "there is death in the pot". In all our large towns we have ever present with us - the German Pork butcher. He gets the credit of being able to make sausages and other delicacies, of anything. In such pork shops, I have frequently seen a small dark coloured accumulation of balls for sale at one penny each. I had the curiosity to have one of these weighed, and asked as to its contents. I was informed it weighed about six ounces,

"Bacteriology: Muir and Ritchie. 1897- Page 228.

"As pointed out by Woodhead, milk from cows thus affected is probably the great source of tuberculosis which is so common in young subjects."

"On the Prevention of Consumption" 1900.

A Report to the Right-Hon.^{ble} The Lord Provost,
Magistrates and Town Council of the City of
Edinburgh, by the Public Health Committee.

Page 105.

and was made of minced liver with meal, spices, and "some other things" all minced up and mixed together, and very largely bought by the poor; and after being sliced and fried, was considered a great treat. Whether it may be from jealousy or some less selfish reason it is difficult to say, but I am informed by our bona fide Scotch butchers, that such German rolls may receive into their interior, some parts of the offal of cows which it would be safer not to submit to the scrutinising gaze of one of our veterinary meat inspectors.

Besides meat-infection, we have many recorded instances of tuberculous infection from the ingestion of uncooked milk from tuberculous cows. On 9th February 1899, Professor Sir J. Grainger Stewart in his evidence before the Public Health Committee of Edinburgh, stated, "It is too painful a thing to see a healthy child go to the country, and to see it come back out of health with enlarged tonsils, and to discover in the tonsil a tubercular process going on, and then see the glands of the neck becoming

"The Animal Tuberculozes," by Howard
1895. Page 84.

enlarged, and ere long a surgical operation becoming necessary to save that child's life. It is true that such an infection may be derived from other sources, but it may also be due to contaminated milk". We have also numerous instances of Tuberculosis being caused by the injection of uncooked tuberculous milk - I have already made reference to two separate instances at page 80, - but the following case recorded by Howard he states is almost as convincing as an experiment: - Dr Gosse of Geneva, whose father and grandfathers were doctors, had the misfortune to lose, last year, a grown-up daughter, seventeen years old. Up to the end of 1892 she was in perfect health, and had never exhibited the slightest sign suggestive of tuberculosis. But during the early months of 1893 she began to waste away, and for ten months all the doctors in Geneva examined her, and were unable to discover the cause of the wasting. Finally she died. Dr Gosse had the courage to make a post-mortem examination, and found tuberculosis of the

Report of Royal Commission on Tuberculosis 1898.
Part II. Page 192. Answer 4345.

intestine and mesentery. How had the girl contracted the disease? Heredity could not be alleged as the cause, seeing that none of her ancestors, either on the paternal or maternal side, had suffered from tuberculosis. The localization of the disease permitted one to assert its alimentary origin. It turned out - that every week Dr. Gosses family used to spend Sunday on the hills, at a small estate which he had inherited, and that one of the great delights of this young girl was to drink milk fresh from the cow. Perhaps the cows were tuberculous! The event proved the justness of the supposition, for, on being submitted to the test of tuberculin, four out of the five cows on the estate were found to be tuberculous: they were immediately slaughtered, and the autopsy showed that two of them had tubercular disease of the udder". In his evidence before the Royal Commission on Tuberculosis - Dr. Latham - who deservedly stands so high as a Statistician - states, "I have a general impression, from my long experience in Lancashire, that to a certain extent tuberculous meat (and to a much

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Ibid. Answer 4350.

greater extent tuberculous milk) has an evil effect upon those who consume it." In referring to the increase in the *Tuberculosis mesenterica* deaths, while all other tubercular deaths were declining, he states that the increase seems to have been confined to the "3-6 months" age, the other age groups under one year indicating a delayed decrease, a possible explanation of this - he states - is to be found in the relationship between *Tuberculosis mesenterica* and *Diarrhoea*, and that whether from the difficulties of diagnosis - in the case of *Tuberculosis mesenterica* - which are often great; or because *Tuberculosis mesenterica* is really more fatal during epidemic diarrhoea periods, the rates from the two diseases almost invariably rise and fall together. *Tuberculosis mesenterica* - he adds - is a very indefinite cause of death, and that diarrhoea is not infrequently mistaken for it." In the Registrar-General's Monthly Returns, it is only the total deaths during the first year of life that are stated, the deaths from individual diseases being classified under 0-5 years and so on. I have subjoined a table

Deaths from
Diarrhoea.

Deaths from
Typhus mesenterica.

(a.)

Year	Glasgow, Edinbro', Dundee.			Glasgow, Edinbro', Dundee.		
	Glasgow.	Edinbro'.	Dundee.	Glasgow.	Edinbro'.	Dundee.
1899.	561	175	154	252	69	42
1898	478	162	153	196	62	64
1897	448	119	150	191	65	39
1896	321	100	108	185	54	40
1895	454	141	140	230	67	49
Average of the five years.	452.2	139.2	141	210.8	63.4	46.8

Average of the five years.

Deaths from Diarrhoea and Typhus Mesenterica in Glasgow, Edinburgh and Dundee, for each month during the five years 1895-1899.

Diarrhoea in black figures. Typhus Mesenterica in red figures.

Year	Deaths per Month											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1899	16	13	16	13	16	13	63	169	174	42	15	11
	19	19	26	24	25	25	16	22	25	20	13	18
	16	14	15	16	17	16	69	119	114	47	26	9
	10	9	16	14	15	21	24	22	22	18	13	9
	13	13	15	11	27	9	51	207	58	17	11	10
1898	9	9	9	16	22	20	59	43	64	25	17	15
	15	8	9	16	22	20	59	43	64	25	17	15
	10	12	12	14	22	21	27	15	20	13	8	11
	9	15	18	18	19	41	115	71	69	42	24	13
	17	22	26	25	22	17	28	21	27	7	7	11
1897	5	7	6	4	5	8	14	43	65	12	8	6
	7	7	1	3	4	7	7	11	4	6	3	9
	6	6	3	2	6	6	3	4	4	31	1	2
	4	4	3	2	6	9	6	4	4	9	1	7
	3	3	10	7	6	5	7	3	2	10	16	6
1896	6	2	4	6	5	7	11	22	16	11	7	3
	2	2	7	6	5	7	4	3	4	2	3	3
	6	2	4	4	4	4	14	23	36	27	3	5
	2	1	5	7	7	11	14	23	36	27	3	5
	2	4	6	2	2	6	6	5	4	9	7	5
1895	5	5	4	4	2	9	16	30	35	9	6	14
	7	7	1	3	4	7	7	7	7	3	2	2
	6	6	10	7	6	5	7	3	2	4	9	8
	2	1	5	7	7	11	14	23	36	27	3	5
	2	4	6	2	2	6	6	5	4	9	7	5
1899	5	5	4	4	2	9	16	30	35	9	6	14
	12	9	4	4	2	9	16	30	35	9	6	14
	12	7	5	10	8	11	15	23	25	15	2	6
	6	5	5	7	8	5	4	5	5	7	2	8
	5	14	15	8	11	9	13	15	21	25	7	6
1898	11	8	4	4	9	12	14	14	14	7	7	7
	11	8	4	4	9	12	14	14	14	7	7	7
	6	5	3	2	6	5	5	3	3	3	1	2
	6	5	3	2	6	5	5	3	3	3	1	2
	6	5	3	2	6	5	5	3	3	3	1	2
1897	5	5	4	4	2	9	16	30	35	9	6	14
	12	9	4	4	2	9	16	30	35	9	6	14
	12	7	5	10	8	11	15	23	25	15	2	6
	6	5	5	7	8	5	4	5	5	7	2	8
	5	14	15	8	11	9	13	15	21	25	7	6
1896	11	8	4	4	9	12	14	14	14	7	7	7
	11	8	4	4	9	12	14	14	14	7	7	7
	6	5	3	2	6	5	5	3	3	3	1	2
	6	5	3	2	6	5	5	3	3	3	1	2
	6	5	3	2	6	5	5	3	3	3	1	2
1895	5	5	4	4	2	9	16	30	35	9	6	14
	12	9	4	4	2	9	16	30	35	9	6	14
	12	7	5	10	8	11	15	23	25	15	2	6
	6	5	5	7	8	5	4	5	5	7	2	8
	5	14	15	8	11	9	13	15	21	25	7	6

(b.)

Glasgow.

Edinburgh.

Dundee.

of the takes mesenterica and diarrhoea deaths in Glasgow, Edinburgh and Dundee respectively for the five years 1895-1899. In part (a), it will be seen that in any one year in both of these diseases there is not much divergence from the average of the five years together. In part (b) on the other hand while there is the marked autumnal rise in the diarrhoea deaths, there is practically little change at this season in the deaths from takes mesenterica. I don't think this fails to shew, that in these cities, at least, these two diseases do not rise and fall together, nor yet can diarrhoea be frequently classed as takes mesenterica. Independently however, of this difference of opinion, it is admitted that tuberculous milk is a great channel in the production of takes mesenterica. This mode of infection is a serious matter also when we consider the tuberculous infection stated above by Sir Grainger Stewart, as also the well recognised connection in the causation of Tubercular Meningitis from Takes Mesenterica or some other

"Report of Royal Commission on Tuberculosis"
1898. Part II. Page 167. Answer 3771.

Ibid. Page 151. Answer 3419.

tuberculous affection - That tubercular meningitis is not usually a primary disease is well shown first, in the evidence of Dr. Mivon, M. O. H. Manchester, who states, "I believe that in a number of post-mortems, tubercular meningitis has been found in relation to abdominal tuberculosis, and I accept the view that tubercular meningitis would probably, in the majority of cases, be due to abdominal tuberculosis, and therefore to the ingestion of milk. Is it worth while mentioning one particular experience of my own on this matter? I took a very slight case of Smallpox on one occasion into the hospital, and this child developed symptoms of meningitis and died. I obtained a post-mortem examination, and found that the death was due to early tubercular meningitis; and the only other lesion found in the body was a caseous gland attached to the mesentery. I made a very careful examination. Clearly this child had contracted abdominal tuberculosis, which had then set up tubercular meningitis". Secondly, Dr. Chalmers, M. O. H.

'Report of Royal Commission on Tuberculosis
1898. Part II. Page 146. Answer 3339.

Glasgow, in his evidence before the same Royal Commission, states:—"Tubercular meningitis, however, very seldom occurs as an independent malady. It is usually associated with tubercular disease elsewhere (in the abdominal or bronchial glandular system, or in the bones, for example)."

The necessity for stringent measures being taken to prevent this infection of milk, so constantly used in an uncooked condition, is manifest when we look at the table given on page 64. of this thesis, where of 100 tubercular deaths in Glasgow, 28 per cent. of them were caused by tubercular meningitis, tubercular meningitis, and other forms of tuberculosis. That there is the need for some such change in the law is well illustrated by a quotation from the memorial addressed by the commissioners of the burgh of Paisley to the Secretary of Scotland in 1888: "They pointed out that on an inspection of the milk cows of the burgh by the veterinary and sanitary inspectors, five cows which were very seriously affected with the disease were discovered;

"Report of Royal Commission on Tuberculosis"
1895. Part II. Appendix. Inquiry I. Pages 1 & 2.

and in the present state of the law the local authority and their officials found themselves powerless to stop the sale of the milk of any of those animals, though in one case the cow died from the malady shortly after it had been discovered, and in another case the bacilli or germs of tuberculosis were found by Principal Williams, of the new Veterinary College, Edinburgh, in the milk of the animal. The only alteration in the law on this matter since that date is the addition of Udder disease in the 1899 additional order under "the Dairies, Cowsheds, and Milk Shops Order of 1885" as stated at page 38 of this thesis -

Although there is some difference of opinion as to the significance of Disease of the Udder due to tuberculosis, the general opinion is that unless there is such disease of the udder, no tubercle bacilli can be discovered in the milk produced. Professor Dr. Jodique in his experiments at the request of the Royal Commission shows this very conclusively; - He states, "In connection with this part of the subject there still remains to be

discussed the very important question as to whether the milk ever or frequently contains tubercle bacilli when the mammary gland is not itself the seat of disease. If that question had to be answered in the affirmative, it is obvious that an examination of the milk, either microscopically, or by inoculation, would be of great value as an aid to diagnosis. I have, in many instances, made a prolonged microscopic examination of milk from cows in advanced stages of tuberculosis, but with udders apparently sound, and in every case the search for tubercle bacilli has been unsuccessful. He then gives details of experiments where he inoculated into the peritoneum of guinea pigs, the milk of five different cows, all of which were afterwards killed and proved to be suffering from advanced tuberculosis, but in none of the cases was the udder affected, and in none of these guinea pigs was tuberculosis induced. "In face of these five experiments" he says, and especially since they are in harmony with those made by such reliable workers as Bang and Howard, I am driven to conclude that tubercle bacilli are

"Report of Royal Commission on Tuberculosis"
1895. Appendix. Inquiry II. Page 10.

probably not present in the milk of cows except when the udder is itself the seat of tuberculous disease, and that, in any case, an examination of the milk, whether by the microscope or by inoculation, is quite useless as a means of diagnosis in cases of tuberculosis with the lesions elsewhere than in the mammary gland."

Dr. Sidney Martin details the result of his experiments, thus:—"It is clear, therefore, that when tuberculosis of the cow affects only the internal organs of the body and not the udder, the milk is not infective; but that, in all cases where the udder is tuberculous, the milk becomes infective, and is, indeed, often extremely virulent. Moreover, the butter, buttermilk, and skimmed milk obtained from this class of milk is also extremely infective. There is no question, therefore, that this class of milk ought not to be used as a food; and it is, indeed, certain that its exclusion would lead to a great diminution in the large number of cases of tuberculosis that occur in children."

On the other hand, Principal Dewar of the Royal Dick Veterinary College, Edinburgh, in his address, states:-

"Conference of local Authorities in Scotland on
the Prevention of Tuberculosis held in Glasgow", 1900.

Page 93.

"Bacteriology" by Muir and Ritchie. Page 208.

"Report of Royal Commission on Tuberculosis"
1895. Appendix. Page 143.

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"The frequency with which the presence of the bacillus tuberculosis has been demonstrated in ordinary commercial milk certainly tends in the direction of proving that it may be present where the udder is to all appearance normal. I might refer to the examinations conducted on behalf of the Massachusetts Agricultural Society. The microscopic examination of milk from 36 tuberculous cows, but, so far as the best veterinary examination could determine, with no disease of the udder, the presence of the bacillus was demonstrated in the milk of 22 of the cows, or 33 per cent. Feeding experiments were also carried out with the milk, and in the case of pigs and calves about 50 per cent. of the former and 33 per cent. of the latter became affected with tuberculosis".

According to Professor Bang, the udder is affected in 3 per cent. of all tuberculous cases.

Dr. Sims Woodhead remarks: - "The spread of tubercle in the udder goes on with most alarming rapidity; this I was able to observe in the cows constantly under observation, but I have also noticed on several occasions

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during the interval between fortnightly inspection carried on along with a veterinary Surgeon, that the disease has become distinctly developed. It may be, of course, that the early evidence has been overlooked at the previous inspection, but whether this is the case or not, the spread of the disease was so rapid as to afford very good ground for alarm. The very absence of any definite signs in the earlier stage is one of the great dangers of this condition, and one that it is very difficult to guard against. A most important fact to be borne in mind in connection with tubercular disease of the udder is that it is not by any means confined to those cattle in which tuberculosis has invaded many of the other organs, and is not necessarily associated with an advanced stage of the disease, so that the degree of tuberculosis as made out clinically, apart from changes in the udder, is in many instances no guide as to the changes in the udder itself.

Considering all these opinions just stated, it is essential to prevent the contamination of the milk-supply, and thus remove one great

Glasgow Report on Tuberculosis. Page 92.

channel of tuberculous infection, by having at once isolated any animal proved to be tuberculous by the use of tuberculin, even although there is no apparent evidence of disease of the udder, for this disease is at times difficult to diagnose, and as Principal Dewar says "Nothing is more certain than that tuberculous disease of the udder often exists for a considerable time, with its usual accompaniment, the shedding of tubercle bacilli into the milk, before the slightest abnormality can be detected about the gland by sight or touch".

Besides the disease conveyed to the milk through the cow supplying it, there is also considerable danger of infection through the surroundings of the cow. If there are any defects in the sanitary arrangements of the byre, it readily fosters any infection that may be present. Not only may expectoration be discharged about the stall from a diseased cow, but with its tongue licking the udder, may smear the pastures with diseased expectoration - D. W. Leslie MacKenzie, M.O.H., Leith,

"City of Glasgow Conference on Tuberculosis"
1890. Page 38.

gives most careful directions as to cleaning the udder before milking, the milkmaid to sterilise her hands, that the milk ought never to be collected within the byre, and ought to be cooled immediately after milking; these, and other suggestions he makes all with a view to thorough sanitation, and I am convinced, that although a little trouble would thus be caused, a very great danger would be removed.

Too little attention is given to admitting sunlight and ventilation into our town byres - at least -. I have seen cows stalled in byres where on going in to them direct out of the daylight, you had to wait a few moments before you could see the interior. Besides the darkness, they are so often kept excessively warm, by closing up any ventilation that may be present, with a view to increase the quantity of milk secreted. In town byres the poor animals never get exercise from one month's end to another, and food is stuffed into them - so to speak -, quite converting them into milking machines: under such circumstances the normal metabolism cannot be accomplished, and the

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"British Medical Association"

"Report on Tuberculosis" 1899. Page 2.

Report on Royal Commission on Tuberculosis.
1895. Appendix. Page 176.

animals are thus in a thoroughly predisposed state to receive infection should it be introduced -

The Council of the British Medical Association states -

"The infection of tuberculosis in milk can be destroyed by boiling or sterilisation, but since milk can be obtained free from tuberculous infection, if the cows which yield it are ascertained to be free from tuberculosis by the tuberculin test, it appears to be undesirable to relieve wholesale and retail vendors of their responsibility in this regard by recommending the boiling of milk as the only necessary safeguard." Besides the objection just stated to relieve the vendor of responsibility, most people make great objection to drinking boiled milk owing to its "mawkish" taste, and would consider the risk of infection a lesser evil than having to drink boiled milk. The same objection does not apply - as regards taste - to sterilisation of milk, but Dr.

Smis Woodhead in his experiments on this matter, states the milk vessel, should be placed in a pan containing at least as much water, and to be kept boiling for half an hour.

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—
"The Animal Tuberculosis" by RoCARD. Page 82.

The Weber-Parkes Prize Essay, By Raudome.
1897 - Page 45.

"Tuberculosis" by Hillier. 1900. Page 87.

Inoculation of tuberculosis has frequently occurred. Noeard relates two very marked cases of this mode of infection, and in both cases they were veterinary surgeons, the one wounded himself while performing a post-mortem on a tuberculous cow, and who after submitting to removal of all the swollen part recovered; the other surgeon was less fortunate, he also received a wound under similar circumstances. Staues, and although the wound healed, he developed pulmonary tuberculosis within six months and died. Ransome describes the case of a young medical man, who had an abrasion on the finger when he performed a post-mortem on a child dead of tubercular peritonitis, he developed not only severe local disease but also acute pulmonary mischief, but fortunately eventually recovered. Hillier reports a case related by Koch in which a woman cut her finger while removing the expectoration from a broken spittoon containing tuberculous expectoration, and the finger had to be removed. He also refers to a remarkable case recorded by Lindemann

"British Medical Journal" Vol. I. 1900. Page 789.
"Phthisis in relation to life Assurance." by D. Ransom.

in which two Jewish children were circumcised by a rabbi who was in the last stage of consumption, and who after circumcision, sucked the prepuce, according to the Jewish rites, both children became infected with ulcers on the prepuce and swelling of the genital glands. One recovered: the other's infection continued, the child developing Pott's disease, and dying finally, after a few years' suffering, from pulmonary phthisis. These instances of inoculation are more than enough to prove this source of infection, and to show us what an insidious enemy this tuberculosis is, as it finds entrance to our System, not only through what we breathe, eat and drink, but also through any breach of surface in our frame.

The Hereditary predisposition to tuberculous complaints, to which we have already made some references, has held sway until within the last thirty years, with the public generally, as also with many medical men, this disease is still considered to be hereditary. This question is still kept to the front by the action of life insurance companies, making the

City of Edinburgh Report on Tuberculosis
1900. Page 104.

Ibid. Page 10.

matter of heredity in consumption, one of such importance, as to impose extra rates on the lives of such people. Although the modern view is more and more gaining ground that tuberculosis is not distinctly hereditary. I feel my own views well expressed in the following remarks made by Professor Sir J. Grainger Stewart:-

"People have debated whether we have been right or wrong in our idea that the constitution has something to do with susceptibility. It seems to me that the constitution has a great deal to do with it". In some cases there is a hereditary tendency to the disease, and in many cases an acquired liability. It is just, so to speak, a matter of invaders and invasion. You have the invader, the bacillus, and you have the territory which he is seeking to invade, and a great deal depends on the vitality of the territory which he is attempting to take, whether he succeeds in effecting its conquest or not. We have much in our power with regard to dealing with and strengthening those who are, as we all are, exposed to the invasion of the tubercle bacilli." In the same report, Virchow, - Such an

"Nature" Page 108, June 1st 1899.

eminent authority — States: — "I now dispute this heredity absolutely. For a course of years I have been pointing out that if we examine the bodies of infants newly born who have had no life apart from the mother, we find no tuberculosis in them. I have the conviction that what looked like tuberculosis in the newly born was none of it tuberculosis. In my opinion there is no authenticated case of tubercle having been found in a dissected newly born infant. After the birth certainly invasion can begin very rapidly. All the statistics and other scientific material that may be produced I reckon as indifferent. If it cannot be found that tubercle bacilli exist in an infant that has had no communication with the outer world, then I maintain the outer world must be added, that is an infection from the outer world; whilst up till now it was believed without further question that the infection was conferred on the child from birth". Professor Röffler in a paper on Heredity at the Berlin Congress on Tuberculosis, "showed that Hereditary tuberculosis in the sense —

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"The Animal Tubercloses" Howard. Page 70.

The Etiology of Tuberculosis by D. R. Koch.
Page 154.

"The Animal Tuberculosis, Howard. Page 65.

For instance, of congenital syphilis is unknown. Tuberculosis occurs in members of the same family, mostly because by living together the members infect each other. He quoted one family as an instance of this: - The father and mother, two daughters and seven sons all died of Phthisis. The family consisted of fifty eight other members, not one of whom was tuberculous. The infection was entirely confined to the members of the family living together". Koch declares positively that he has never seen his female guinea pigs when tuberculous transmit the disease to their offspring; and yet, he also adds, "it is never advisable to keep rabbits and guinea pigs for a long time in the same place with tuberculous animals, they are hardly likely to remain free from tuberculosis longer than eight or ten months in infected inclosures". Noeard - who also is an opponent to the theory of hereditary predisposition - states, "The conditions of social life complicate this important question too much for doctors to be able to answer it by

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See page 72. of this thesis.

clinical observation alone. Veterinary Surgeons are in a better position to decide the question than they, for a considerable number of calves only a few weeks old are slaughtered in the abattoirs, and by comparing the number of the calves with the number of the cows which are found to be tuberculous at the autopsy, a fairly distinct idea of the part which heredity plays in the development of bovine tuberculosis can be formed. The most moderate estimates of abattoirs, in districts where tuberculosis is most rare, put the number of tuberculous cows at 2 or 3 per cent. Most statistics are silent on the subject of calves; all inspectors agree that nothing is more rare than tuberculosis of the calf". Howard, also adds; "The doctrine of heredity conduces to the fatalistic resignation of the Orientals; What good to struggle against it; if the tuberculous mother transmits to her child with fatal certainty the germ of the disease? So what one may, sooner or later the seed will germinate! At the most, one will have (on an aged

"Report of Royal Commission on Tuberculosis"
1895. Part II. Page 11. Question 4794.

to put off the evil day." How reassuring, on the other hand, is the notion that hereditary tuberculosis is an exceptional thing; that, far from being condemned to tuberculosis, the child of the tuberculous may easily escape it, and will do so, if it is removed from the family surroundings, in which are realized such a combination of conditions favourable to the occurrence of infection that it is hard to understand how it could possibly escape".

The last quotation in favour of non-heredity, I will now quote is from Professor Bang of the Veterinary College, Copenhagen, - than whom there are few greater authorities on bovine tuberculosis - who states: - "that animals which are 3½ years old, and which, with two exceptions, have shown no trace of disease, although 3 out of every 4 of these animals has been bred from tuberculous mothers, and in some cases from both tuberculous mothers and tuberculous fathers -

From the evidence I can gather in favour of heredity, it is difficult to exclude the possibility

Report of Royal Commission on Tuberculosis
1895. Part II. Page 64. Answer 1183.

Do. Do. Page 45. Answer 782.

of extra uterine infection; one or two such cases are recorded, but the number is ~~too~~ small to come to a satisfactory finding. The following are examples given in favour of heredity, but in all cases, infection otherwise might have occurred. D. Powell in his evidence, quotes the experience of D. Reginald Thomson of cases treated in the Brompton Hospital in which he gives the proportion of hereditary taint of all tubercular cases as 48 percent, i.e., 59 percent for females, and 37 percent for males.

D. Klein, in his evidence, referring to calves not being found tuberculous, states, "I am inclined to think that a large percentage of calves do have some kind or other of deposit which may be easily overlooked, but which there is no doubt is tuberculous; there may be a sort of latent slow form of tuberculosis. I know it is stated that very few calves indeed show tuberculosis, but I am inclined to question that statement."

It is refreshing however to turn from

"Report of Royal Commission on Tuberculosis"
1898. Part II. Appendix. Page 351-

this difference of opinion to these views of Professor Bang's on bovine tuberculosis—and these views are I believe 'ceteris paribus' quite the same in human tuberculosis — he says, "That it is due to the ease with which the infection may spread by air, water, and food, owing to the common life of healthy and unhealthy animals when in confined, badly ventilated sheds. About one per cent. of all calves born, he thinks are affected with hereditary tuberculosis, but the great majority of calves that become tuberculous are infected through the milk. Practically, then, if calves born of tuberculous mothers are isolated from diseased animals from and after birth and fed on boiled milk they will escape the disease. Tuberculin, he believes, gives reliable results in over 90 per cent. of the animals tested, and in the great majority of those which react the test reveals only latent tuberculosis".

We see conclusively, that notwithstanding any slight hereditary taint there may, at times,

tuberculosis is entirely a preventable disease, and being so - as His Royal Highness the Prince of Wales said - Why is it not prevented? This brings us to one of the most important considerations of this wide subject - let the infection enter by whichever channel it may - I mean the matter of "Sanitary Police". For one of the great duties of Sanitary Science is having discovered the causation of the spread of preventable diseases, have it at once removed, or if this be impracticable, have it so bound down as to do as little damage as possible.

Before however finally leaving the matter of the source and channels of infection in tuberculosis, I would remark, that what has been stated under this head as influencing the disease in man, has also - 'ceteris paribus' - the same influence among the bovine race and the other lower animals generally - There is also a most instructive instance, under infection by ingestion, in full corroboration of what

"Report of Royal Commission on Tuberculosis":
1898. Part II. Page 189 - Question 4271.

is stated at page 118, as to the danger from diseased "offal" used as food, it is given by H. A. Newsholme, M. D. H., Brighton in his evidence in answer to the question, "Have you any experience of tuberculosis in pigs?" - "Yes, a very considerable number of pigs have been condemned in Brighton for tuberculosis, chiefly from one particular place, a series of piggeries in a very insanitary condition, just outside Brighton, over which we have no control. The pigs there are fed largely on the offal from the slaughter-houses, and I am quite certain that a considerable number of them become tuberculous in consequence. We are frequently having to condemn pigs that are brought into the Brighton Slaughter houses from this particular place."

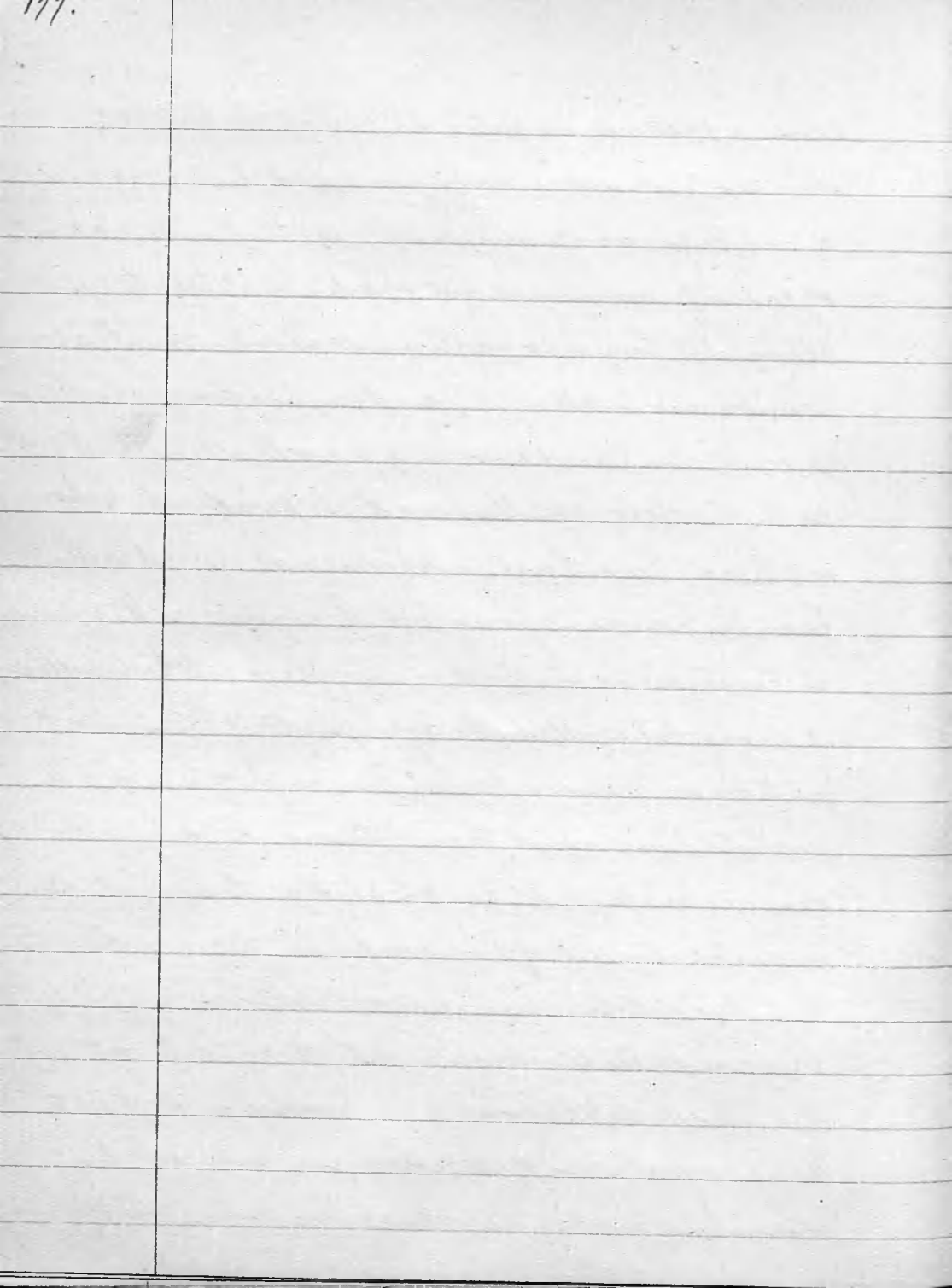
Curability and Prevention.

Although our death-rate from tuberculosis is so great, undoubtedly this disease is to a great extent curable. From the number of bodies examined in which death took place from some other disease than consumption, in which evidence of healed phthisis

"Nature". 15th June 1899 - Page 154.

was apparent - as referred to at page 54 of this thesis - it is evident we have good cause to take courage and go forward. It will never do, to fold our hands despairingly by accepting the French aphorism - "Consumption is a disease from which the rich are sometimes cured, the poor never". Professor Robert, of Rostock, in a paper on the medical treatment of tuberculosis, read before the Berlin Congress on Tuberculosis, gives a concise and admirable resume of the curative treatment of this disease; speaking in the presence of two thousand doctors met together at Berlin to discuss this subject, Professor Robert gave besides the results of his own clinical experience at Forberodorf, the experience of two hundred European general practitioners and in specialists, who in 1898 had treated 50,000 cases of tuberculosis. These results were (1) that we have in our possession no drug which exerts what may be termed a specific action on tuberculosis; (2) that the early stages of phthisis can sometimes be met and cured without medicine of any kind; (3) in acute

cases of phthisis, the fatal termination is neither avoided nor appreciably hindered by any kind of medicinal treatment; (4) that in the majority of cases of consumption medicinal treatment along with hygienic treatment is of the greatest possible use in allaying and easing cough, keeping up nutrition, and exerting a controlling action on the tubercle bacillus and its products? It is added, "Sanatorium treatment must always bear the name - if any - of Brehmer as the founder of this treatment, and if any place is to be labelled it ought to be called, the Görbersdorf treatment, for there in Upper Silesia, Brehmer founded his institution, and there it thrives to day. This "open air treatment" has created quite a revolution in our treatment of consumption. It is now known that it is not the absence or rather diminution of oxygen in the air breathed by the consumptive that was so deleterious to his condition, but rather the accumulation of, so called, "air sewage", by re-inhaling and re-absorbing into the lungs the



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respiratory impurity given off into the atmosphere, this effete animal product acting and reacting on the vegetable tubercular fungus caused it to flourish as surely as manure put into the earth soil causes the vegetable seed sown therein to become fruitful. The "open air treatment" of itself, thus prevents the poor consumptive poisoning himself. The abundant fresh air also increases his appetite. The free exposure to sunlight, in a quiet dustless atmosphere with a Southern exposure has a most prejudicial effect on the propagation and dissemination of this bacillus. The more thoroughly we remove our consumptive from the artificial indoor life of civilisation, to the free natural outdoor life intended for us by nature, the more surely will we get good results in our early treatment of his case - The results already recorded of this mode of treatment - both on the continent and now at our own doors - is most satisfactory, and will do much by reducing the number of invalids and 'paripassu' reducing the numbers of bacilli, to eradicate this disease altogether.

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"Report of Royal Commission on Tuberculosis".
1898. Part II. Answer 174. Page 11.

British Medical Journal. Vol I. 1900. Page 1551.
(23rd June 1900).

The prevention and complete eradication of this disease must be constantly kept before our municipal authorities. It will not avail us much to calmly accept the dictum of Mr. Elliott, secretary to the Board of Agriculture, even as regards bovine tuberculosis when he says; "I think I should say that even if the adoption of stamping out was necessary it would not be possible; and that if it were possible, it is not necessary".

Professor Clifford Allbutt, at a meeting held in Oxford to form a local branch of the National Association for the Prevention of Tuberculosis, indicates the principles on which preventive measures must be based, which he epitomised as a crusade against three "D's" - "damp, darkness, and dirt; a crusade which, as he reminded his hearers, every individual could carry out in his own home." As besides the individual householder, this question is largely one for municipal authorities, it is most encouraging to find that both in Glasgow and Edinburgh - besides many other towns and counties also - the

Hagge's Principles and Practice of Medicine,
1886 - Vol. I. Page 988.

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crusade has already begun, and most valuable reports have already been published by those cities, to which I have frequently had the pleasure to refer.

This connection of dampness of soil with the prevalence of phthisis was in 1862, remarked upon by Dr. Bowditch, of Boston, who brought before the Massachusetts Medical Society "a mass of evidence which led him to believe that, in that State, consumption, instead of being equally diffused through all parts of it, prevails especially in such places as are situated upon a damp soil, and seldom occurs when the soil is dry." Far more conclusive, because resting upon an accurate statistical basis, is a body of facts which were collected by Sir George Buchanan during the years 1865 and 1867 in England, and published in Mr. Simon's ninth and tenth reports to the Privy Council: It was found that in several places there had been a great diminution in the general death-rate, and that the prevalence of enteric fever had become much less, especially where a good had been substituted for a bad water supply, and where drainage-

Edinburgh Public Health Report on
Consumption. 1900. Page 111.

-works had taken the place of cesspools or middens. But in other towns it was by a decrease in the number of cases of phthisis that the good effects of sanitary improvements appeared to be manifested; and the particular change which coincided with this result was found to have been a drying of the ground by drainage of the subsoil." With the publishing of this valuable information began a marked diminution of the tubercular deathrate, but in 1872 and chiefly in 1875 when the Public Health Acts came into force, this diminution became phenomenal.

The removal of the second "D", namely, darkness is most beneficial when we remember how the tubercle bacillus flourishes in the dark - truly "because its deeds are evil." Regarding the third "D", namely dirt or dust, Professor Greenfield in giving some of the conditions which tend to the increase of consumption, speaks of dust as "not only a carrier of infection, but that it also sets up changes in the lungs which make infection by tuberculosis easier, and excite destructive changes". He adds, "It is a well known

British Medical Journal. Vol. I, 1900.
27th January 1900. Page 215.

fact - that all the diseases of the lungs which are produced by dust - (what we call "dust diseases"), with the one exception of coal dust, are usually complicated by the presence of tuberculosis. If we could remove these three factors - these three "D's" - from our homes and workshops, we would be a long way towards our desired goal of the thorough extermination of tuberculosis.

In opening a discussion by the Civic Society of Glasgow on "Municipal Duty as to Tuberculosis", Dr. John C. McVoil summarised some of the more important directions in which municipalities may take the lead, under the following heads, viz:-

- (1) The abatement of the smaller nuisances in towns, to ensure as much sunlight as possible penetrating into the streets and houses;
- (2) watering and flushing the streets and pavements in dry weather to prevent the desiccation of expectorated matters;
- (3) the provision of sufficient air space and ventilation in elementary schools;
- (4) regular meat inspection by qualified veterinary surgeons in every city;

(5) adequate supervision of the milk-supply to ensure as far as possible freedom from tubercle-bacilli ; (6) the municipal provision of sanatoria for consumptives ; (7) notification of tuberculosis, voluntary until such time as the education of the public made it possible to introduce compulsory notification ; (8) the extension and cheapening of travelling facilities, by which even the comparatively poor workers in our great towns can establish their homes, and rear their families outside the central zones of smoke, fog, and foul air".

I intend now to take up these headings one by one, in the completion of this part of the subject, and (1) "The abatement of the smoke nuisance in towns, to ensure as much sunlight as possible penetrating into the streets and houses." Although the CO₂ and tarry matters - given off from so much combustion of coal always going on in our midst - are not usually found at a higher level than 600 feet, still most towns are so situated that you have to go quite into the country before you attain even a much

"Alkali Works Regulation Acts, 1881."

Section 5: "Every work in which acid is produced or used, shall be carried on in such manner that the acid shall not come in contact with Alkali waste, or with drainage there from, so as to cause a nuisance."

An Act for the Abatement of the nuisance arising from the smoke of furnaces in Scotland 1857, with amendments 1861 & 1865.

Besides making provision against the issuing of smoke from working of engines whether locomotive or otherwise, also provides against steam boats while stopping at any pier or port, or when plying on any part of a river which at such part shall not exceed a quarter of a mile in breadth, and compels such to consume most of their smoke.

Besides these, we have in the Public Health (Scotland) Act, 1897, in Section 16, and Subsections 9 and 10, very stringent and comprehensive regulations against the issuing of smoke, the same being deemed to be a nuisance and liable to be dealt with summarily in manner provided by this Act.

lower level. In large towns it is not alone the above combination with which municipal authorities are supposed to deal, but also the hydrochloric, Sulphurous and Sulphuric acid fumes driven off from certain manufactories which render the air quite acid, and destroy all vegetation in the immediate neighbourhood - So well seen on entering Buchanan St. Station in Glasgow with a north train - The railway engines too add much to this clouding of the air in towns, and although Smoke Inspectors are appointed, they are not ubiquitous, and in this, as in many other things, the old rhyme holds true; "when the cats away the mice will play"; On page 189, I have stated Acts passed to abate this nuisance, but unfortunately the power so obtained is too often overlooked. If in all public works the combustion of this smoke was fully maintained, it would much improve the atmosphere of towns. If all dwelling houses were compelled to have their chimneys more steadily cleaned, there would be less dense smoke issuing from them, and the

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abominable smell from a "chimney on fire" would not so frequently cause such irritation of our olfactory nerves. On many days there is such a pall surrounding our large towns that the Sun's rays are quite obstructed in their beneficent journey. Although it does not come under the category of small nuisances, yet as an obstruction to light, it is strange how readily people convert into evil what is intended as an elevator of taste. I mean window flower culture, which in many towns has become quite an institution. In poorer districts, from the outside the effect is charming, but I have often pictured the poor puny inmates dwelling in rooms whose every ray of sunshine is thus obstructed by this profuse floral decoration of the window. It is apt to bring to one's thoughts the remark "making the outside of the cup clean" while within are decaying inmates starved of the free sunshine of Heaven - These things are not as they should be, and it will not be otherwise until our municipal authorities arise from their

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"City of Edinburgh Report on Tuberculosis"
1900 - Page 80.

lethargy and hester themselves to produce an amelioration - as is being so nobly done in Glasgow and Edinburgh as regards tuberculosis - both in our smoke nuisances and all other obstructions to the free diffusion of sunlight - in every corner of our towns.

(2). "Watering and flushing the streets and pavements in dry weather to prevent the desiccation of expectorated matters". On this point, Sir H. D. Littlejohn makes a capital suggestion for Edinburgh, he says, "I am convinced that the time will come when sea water will be pumped to the comparatively unknown reservoir, of large dimensions, on the Castle Hill, whence it could be conveyed in all directions, and prove useful in flushing our chases, watering the streets, and extinguishing fires". Although all cities are not so well circumstanced as Edinburgh in having a "Forth" at their doors, yet in too many places where such provision is attainable no advantage is taken of it to thoroughly cleanse the highways. In all towns the fire hose could be used - without a very great waste of water - and

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all pavements and streets flushed - more especially in poorer parts of the town - and while still wet, be thoroughly swept. If this was done in the way Sailors wash the floors of their decks, we would hear less of the spread of tuberculosis. Instead of sweeping the streets while wet, our Sanitary officials permit a horse sweeper - without even the advantage of rubber shoes - to perambulate our streets just at the time when evening ends and the new day begins, making such a clanking noise, and scattering far and wide all the bacilli loaded dust of our streets in clouds, to settle down on our window frames, and be freely rushed into our morning rooms when the windows are opened for ventilation.

- (13). "The provision of sufficient air space and ventilation in elementary Schools." Very great improvement in this respect has taken place in late years, the elementary teaching of the Sanitary Sciences is having effect on both teachers and pupils. Still much has yet to be done. Professor Greenfield

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City of Edinburgh Report on "Tuberculosis"
1890. Page III.

of Edinburgh University speaks faithfully not only as regards board schools, but even in better class schools where he states that in some of them the children are often practically deprived of food from eight to half past three or later, the class-rooms are crowded, and insufficiently ventilated, and there is no arrangement for exercise, and there is much night work. Besides this doleful picture, Professor Greenfield draws attention in his remarks to the rooms let in lodgings to students in our large towns. I don't think too much prominence can be given to his remarks on this head, as so many young fellows hard pushed to "make both ends meet"; and yet so keen to obtain a college education, are glad to creep into any corner which the slender purse can attain to, no matter how insanitary it may be; how often during these days the seeds of mischief are received in the lungs, propagating rapidly, and often just on obtaining the climax of his ambition, he has just to lie down on a bed of sickness and

meet a premature grave - Much has been done to prevent this mischief, by many noble souls, who being endowed with a full share of this world's goods, freely provide bursaries for our deserving youths, and thus save many a bright student from a tubercular ending to his career -

In our day schools we should have gymnastic exercises daily - and not a prolonged exercise once a week tiring all the muscles and doing more harm than good - and all children - boys and girls - as part of their school work taught to swim; and during these hours of absence, the empty schoolroom should be thoroughly ventilated by open doors as well as windows. If attention like this was more given to our board school children, tuberculous complaints would be more frequently prevented by well nourished, well developed pupils.

(4). "Regular meat inspection by qualified veterinary surgeons in every city". I have already - at page 86. made reference to the necessity of a

Conference in Glasgow of Local Authorities
on the Prevention of Tuberculosis - 1900 -
Page 111.

through veterinary training of our (meat inspectors). The manner in which this inspection should be accomplished is of first-rate importance. In a paper on the "Establishment of Public Abattoirs" read at Glasgow by Professor Stockman of the University, he gives expression to difficulties surrounding this proceeding which I can most heartily corroborate. He states, "No doubt the ideal state of matters would be to destroy all tubercular animals and to reject their flesh as food; but you are aware as well as I am, that at present this is impossible, and that a compromise is to be made. The point to determine is to what extent should this compromise be carried? There is no doubt that if too strict an examination is carried out, which goes against the common sense of experts and against the common sense of people, it gives rise to smuggling of carcasses and other evils which are perhaps worse than the disease". Several instances of confirmation of this statement of the danger resulting from over strictness

"Report of Royal Commission on Tuberculosis"
1898. Part II. Page 186. Answer 4212.

of inspection with a want of uniformity in places adjacent - might be given, I will however merely refer to one instance quoted by Dr. Newsholme of Brighton - where the inspection is most searching - he states, "We found that every Sunday morning meat was brought into the town from feres in a clothes-basket on a trolly, and was found in a very bad condition. Then again, frequently cattle are killed on neighbouring farms, and the meat is subsequently brought into Brighton: occasionally we have seized this meat and had it condemned, but I fear that some of it undoubtedly escapes detection."

Besides the above difficulty, we have to contend with the commercial loss to our home farmers from the purchase of "dead meat" by our butchers as a protest against the seizure of home cattle, without any compensation being given. From a sanitary point of view however this is not any danger, as we have already remarked on the freedom from tuberculosis, our dead meat, as a rule maintains. To give one opinion in

"Report of Royal Commission on Tuberculosis"
1898. Part II. Page 173. Answer 3898.

justification of this statement, Mr. W. H. Green of Manchester stated, "A butcher now goes into a market and he buys a beast; and for anything he knows it is all right and healthy; it is passed by the inspector in the market, and he gets it to the slaughter-house and he kills it; then perhaps it is seen to be just touched with that tubercular disease and it is taken from him. Naturally he does not want any more taken from him. He buys his meat ready killed, or goes to the nearest part of landing, and will not have any more taken from him. Our cows, they seem to think, are more affected than the bullocks and heifers, and naturally the trade in our cows is almost knocked on the head altogether."

The most certain remedy for all these difficulties, would be to have tuberculosis completely eradicated from our herds. But to many, in the present state of public opinion, this procedure would be considered utopian, so what should be suggested instead? To remove meat inspection altogether would be preposterous - more especially

"Report of Royal Commission on Tuberculosis"
1898. Appendix.

Do Part II Page 28. Answer 408.

from the danger to the poor through the dealings of unscrupulous butchers - ; on the other hand, to continue extreme severity in one place, and extreme laxity in a neighbouring part of the country, - as at present is done - is most unfair. The proper system must be introduced of having a universal standard of inspection instituted, such as is already in force in Continental (meat) inspections. It is suggested by many authorities - see evidence of Mr. W. Field M.P. - that the local Government Board should lay down a uniform system of what should be seized, with a Court of appeal composed of a jury of butchers and a veterinary surgeon -

Combined with this, public abattoirs alone must be permitted, and a sufficient number of thoroughly trained inspectors, able to overtake the examination of all carcasses.

- (5). "Adequate supervision of the milk-supply to ensure as far as possible freedom from tubercle bacilli": As we have already referred - at page 146 -

"Report of Royal Commission on Tuberculosis"
Part II. 1898. Page 278. Answer 6642.

Report of Departmental Committee on
Pleuro-Pneumonia and Tuberculosis:
1888. Part II. Page 249. Answer 7848.

Report. Part I. Page 16. Section 45.

to the precautions advisable to prevent contamination of the milk from the cow's environment. As milk is so sensitive to the absorption of all surrounding influences, our first consideration should be the transference of all town dairies to the country; this is absolutely necessary also in the interest of the cow herself, as tuberculosis spreads so readily in a town dairy if once it is introduced. The following opinions will prove the necessity of what I have stated. Mr. C. Middleton - a member of Council of the British Dairy Farmers Association - states, "I think that the time has come when cows ought not to be kept in town dairies." Sir Charles Cameron, M. O. H., Dublin, states, "I say under no circumstances ought a dairy yard to be in a city, because - I do not care what conditions you propose - it is impossible to have a dairy-yard which would not be more or less of a nuisance". The Royal Commissioners in 1898 reported, "We consider that the presence of cowsheds in a city must almost inevitably

cause a nuisance, especially where cows are kept in them throughout the summer. The proper place for the production of milk is in the country, whence its transport to the city is easy and rapid. There is this further consideration in support of our view, important, we think, in its bearing on any attempt to eliminate tuberculosis from British and Irish herds, namely, that isolation of an infected animal is generally impossible in a town cowshed. "Against the ground in towns is so expensive to purchase, that town byres are constructed as far as allowed, to enable the largest possible number of cows be stabled in the smallest available cubic space possible. In the country ground being so much cheaper, it is much easier to give each cow a minimum of 800 cubic feet, besides having thorough ventilation-

Dairies ought also to be conducted on a large scale, and in towns suitable premises, on account of the reasons given, are difficult to obtain. I would again, on this subject, give

"Report of Royal Commission on Tuberculosis"
1898. Part II. Page 117. Answer 2676.

the opinion of Sir C. Cameron - with which opinion I heartily coincide; he states, "I have been always most anxious in my own country that these little-dairy-establishments should be got rid of altogether and that the milk trade should fall into the hands of capitalists. We have a few of that kind round Dublin, and it is a pleasure to go into their dairy yards and see the cleanliness of the animals. They are groomed just like horses instead of having, as is the case in the smaller dairies, thick masses of cow-dung all over their bodies and the udders dirty. The small men never wash their cows by any chance and the manure is not removed as it ought to be removed twice a day at the very least - from the neighbourhood of the cows, and the milking is carried on in the neighbourhood of the manure".

How are we to accomplish this removal of all town cowsheds to the country, and obtain the necessary land that they have the same "open air treatment we find so successful in the human subject - Although it may perhaps be considered

Board of Agriculture.
Agricultural Returns for Great Britain
for 1899. Issued 1900.
Page xxviii c.

utopian, the following plan forces itself upon my mind as satisfactorily solving part - at least - of the difficulty. On our farms so much of the land is taken up by the 'rotation of crops' it is difficult to obtain additional fields where the cattle can pasture all day. According to the returns issued by the Board of Agriculture, I find in 1899, in the United Kingdom we grew 67,715,698 bushels of barley off 2,159,396 acres of arable land, and this quantity has been steadily increasing year by year. In the United Kingdom in 1899, we have 4,133,249 cows reported as giving milk.

To have a cow constantly on the grass - allowing for all contingencies - would require one acre of arable land, so that by discontinuing the growth of barley on these 2,159,396 acres, we would make provision for fully one half of all cows in milk. Our home barley - which is equal if not superior in quality to the imported products - is only about one ninth of the foreign barley imported, as we import 25,510,594,456 bushels

"Report of Royal Commission on Tuberculosis"
1898. Part. II. Page 246. Answer 5709.

in 1899. Very little barley is used for cattle feeding, in its raw state. The quantity used for making pot-barley for domestic use is also insignificant. The whole barley grown here, and the bulk of the imported barley are all used for the manufacture of malt. After the extraction of the alcohol from this malt, the grain is used for feeding cattle, and I will quote one instance of the result of this feeding. Mr. J. Nuttall, - a member of the Diseases Committee of the British Dairy Farmers Association - stated, "Burton-upon-Trent is situated upon this exact district where we always expect to get the grape cows from; and there you see wagon loads of grain spread on the ridges, and the cows feeding upon them. They use them to an enormous extent; and especially does it seem to me to bring them into a sour and acrid condition when they give to them that cut, dry stuff. It seems to force the milk, and to make the worst milk that can be produced. My experience is such that I put a clause in all my agreements that if they feed them with

"The Animal Tuberculoses". by Howard.
1895. Page 103.

grains that I will not have the milk at any price".

The question therefore is, are we justified in using so many thousand acres of land in the sole manufacture of Alcohol, which acres are of themselves sufficient to maintain more than half our milk cows in a state of freedom and health in the open air.

Personally my answer would be emphatically, no.

Having therefore got our dairy cows transferred thus to the country, how are we to free them from tuberculosis, and thus stamp out the disease? I would

answer this question in the following words of Sweed,

"All those engaged in agriculture, in breeding, rearing, feeding, or fattening, ought to carry out, each for himself, the prophylaxis of the disease. Each of them is directly interested in it. The method-

-ical use of tuberculin, by denouncing the sick animals at the outset of the disease, permits one to isolate them, and to protect the sound animals

from all danger of contamination. As the young animals mostly escape the infection, breeding would not be seriously interfered with, and the

"Report of Royal Commission on Tuberculosis"
1898. Part II. Page 283. Answers 6793, 4, 5.

"Report on Tuberculosis" 18th Jan'y. 1899.
Issued by the Council of the B. M. Association.
Page 2.

vacant spaces would be filled in a few years. Of course, a farm, once made healthy, ought to be protected from reinfection; to effect this, it would be sufficient to introduce into it no new animals without having these previously tested with tuberculin. Thanks to these simple means, owners of cattle by their own action would be able, quietly and with little expense, to free themselves from the heavy tribute which they pay every year to tuberculosis, and that, too, without any assistance from the State". Regarding this heavy tribute just stated, Mr. H. Sessions, F.R.C.V.S. says, "I think the total loss, taking the statistics of the Board of Agriculture, to the farming community at present - from tuberculosis - is roughly somewhere about £20,000 per annum."

In concluding this section, I would quote the following from the Report issued by the Council of the British Medical Association: "Sanitary Authorities should possess adequate means for the systematic pathological examination of the

milk supplied by retail or by contract in the district, whether it be produced within or without the district. Urban Authorities ought to have power to examine, or cause to be examined, cows, the milk of which is sold within their boundaries, wherever these cows may be, and should have the right to prohibit the sale of milk from any cow which is suffering from tuberculosis, or any disease which may render the use of such milk dangerous or injurious to health. The powers of local Authorities for the systematic inspection of dairies and cowsheds should be extended so as to permit the examination of all cowsheds and dairies from which milk is sent into their districts, whether such dairies and cowsheds are situated within or without their district."

(6). "The municipal provision of Sanatoria for consumptives". Whether the views are still held by some authorities as was freely believed twenty years ago by several statisticians, that owing to the diminution of zymotic deaths, many young

"Vital Statistics" Newsholme 1899. Page 316.

weakly lives were thus spared, to blossom afterwards into full-blown adult consumptives — although in showing the falseness of this doctrine Dr. Newsholme so well remarks, that statistics don't confirm the doctrine that weakly children are more prone to attack from zymotic diseases than other children in similar situations — the fact holds true that we have still many tubercular diseases requiring our utmost care in their management. We have now the benefit of our Public Health Acts, and with removal of damp dwellings, overcrowding, and — in short — all the "D's" to which we have already referred, the children lately being born of tubercular parents, even though having a strong constitutional tendency to the reception of the disease, are to a much greater extent protected from infection, and thus will reduce more and more in the coming years, the number of tubercular cases our profession will be called upon to deal with. In our country, we have not yet attained to that stage of paternal govern-

British Medical Journal. Vol I. Page 1353.

3rd June. 1899.

ment so well illustrated by the action of the German Government in 1881, in instituting a general assurance under State control, for all whose incomes are below £150 per annum, which gives the workman unfitted for work by sickness, accident, invalidity, or old age, a legal right to a provision sufficient to render him independent of public charity or poor-law relief. The Tuberculosis Congress in Berlin last year - to whose proceedings we have already referred - was promoted by the Central German Committee for the Establishment of Sanatoria for Pulmonary diseases. It was in 1892 that the first Sanatorium for the poor was established at Falkenstein. During the last few years the progress in this direction throughout Germany has been astonishing, and more Sanatoria for tuberculous patients of the working class exist in Germany than in any other country. The Assurance Associations in Germany send their incipient consumptives to these Sanatoria, and pay for

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British Medical Journal. Vol. II. Page 1563.

2nd December 1899-

their maintenance the amount the patient is legally entitled to by the State's directions, this is proving so satisfactory to all concerned, that in Germany these Sanatoria for the poor will soon become universal. With us, however, matters are quite different. Our poor have no such State provision for sickness and old age, and the large proportion of our working men's benefit association, provide a small amount weekly during a limited period, but their main use is to assure so many pounds to pay sick-bed and funeral charges, after the poor patient has "shuffled off this mortal coil".

At the twenty-fifth Annual meeting of the Poor-law Conference held at Manchester in November 1899, the Chairman of the West Derby Union in introducing the discussion, formulated a recommendation that Poor-law unions might combine together in districts, and establish a joint Sanatorium for the treatment of consumption in its early stages. The three Unions of Liverpool have already combined

for this purpose, and have purchased an estate overlooking the river Dee, on which to erect a Sanatorium. This is the first attempt made in this country by poor-law guardians to cure consumption, and the scheme has the approval of the Local Government Board. It is most encouraging to find poor-law guardians thus bestirring themselves. For there is undoubtedly a real danger to the community from the poorer patients, whose poverty prevents their isolation, whose ignorance causes neglect of precautionary measures, and whose families and neighbours are specially susceptible to infection from the unhygienic conditions under which they live. It is therefore by providing for the poor, that the greater safety of the community is secured, whilst the individual is restored to his place amongst the workers.

The National Association for the Prevention of Consumption is doing noble work in fostering the establishment of such Sanatoria. Under the auspices of the branch of this association, a

British Medical Journal. Vol. I. Page 1606.

30th June 1900.

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most interesting instance of helping those who want to help themselves, and are yet not able to pay a large sum, is shown in the County of Durham, where Horn Hall, Stauchope, has been taken and converted into a Sanatorium; and that bodies of workmen subscribing regularly three pence a man quarterly, shall have the first claim on the beds for themselves and the members of their families to the full extent of their total subscription -

In Scotland, by the munificence of Mr Provost Moncrieff, who has given £10,000 for the purpose, Dundee will before long possess a Sanatorium for Consumptives. In Perth, too, through the generosity of Sir Robert Pullar in giving £3,000, a Sanatorium for Consumptives - able to pay 5/- and upwards per week - is being built on Kinnorell Hill. Although private charity and medical associations are doing much in this direction, the main responsibility must rest on our Poor-law authorities, and Public Health Committees of our Town Councils to move in this direction;

British Medical Journal. Vol. II Page 405.
18th August 1900.

and they must be shown that it is their duty, to establish Sanatoria in all parts of the country.

Much ventilation to this Subject has been given by the Discussion on "Rate-Supported Sanatoria for Consumptives" at the annual meeting of the British Medical Association held at Ipswich this Summer. As pointed out there by Dr. N. Row, the knowledge that consumption is an infectious disease is becoming so universally known, that soon any workman suffering from a cough and spit will be practically "boycotted", and prevented earning his bread. It is well therefore that provision be made for such cases in Sanatoria, and that the public also should be fully instructed that the infection given off by consumptives is mainly through the sputum, and that if any workman be careful to spit only into his prepared sputum, he can continue at his work with safety to those around.

Sanatoria are only suitable, or at least intended, for early cases of the disease, but

City of Edinburgh Report on Consumption
1900 - Page 103.

No. Page 120.

to deal with the numberless cases of advanced disease we must refer to our next head - that of Notification.

(7). "Notification" of tuberculosis, voluntary until such time, as the education of the public make it possible to introduce compulsory notification.

In February 1899, the Public Health Committee of Edinburgh having asked the leading doctors of Edinburgh to confer with them in a Conference on Consumption, put to them this question; "Does it, in your opinion, lie upon us, the local Authority responsible for the general health of the City, to make provision for the separate treatment of those who are thus a danger to others? If so, of what kind and to what extent?" The doctor's reply is, "It is impossible, as has been already indicated, to provide hospital accommodation for all consumptive patients. It falls to be considered, therefore, whether it is the duty of the Corporation to supply hospital accommodation at all for such patients, and, if so, at what stage of the disease - The Joint Committee have weighed the arguments pro and against -

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hospital provision, and have concluded that it is well within the scope of municipal duty to provide means of isolation for patients who, in the words of the Medical Officer of Health, "imperfectly nursed in their ill-ventilated and too often over-crowded homes, are constant sources of danger to the community". In the opinion of the Committee, such provision should be made by the City, but should be restricted to the really dangerous, i.e. advanced, cases of the disease. If the hospital is to be of service to the community, from the preventive point of view, such patients must be kept until they die, and it must be borne in mind that the duration of cases, even of advanced consumption, - more particularly when well cared for in hospital, - is a lengthy one. "This reply, in view of the infectious nature of the disease in its early stages too, is a most remarkable one; as no provision is here asked to be made to snatch the incipient cases from their surroundings, and thus isolating and, in many cases, curing them, prevent the formation of the advanced cases needing hospital provision.

"Report on Tuberculosis to Public Health Committee"
Manchester. 2nd Feb. - 1899.
B. M. Journal. 24th September 1899.
Edinburgh Report on Consumption. Page 112.

7th July 1900. Page 45. "B. M. Journal".

How are we to discover these cases of tuberculosis, whether in the incipient or advanced stage - If full provision was made for incipient cases, and the knowledge thereof became well known, many such cases in the earliest stages would be only too thankful to make application - but many through indifference to "a simple cold"; or from deficient experience to interpret the gravity of their symptoms, would not seek advice, and therefore to obtain information of all cases, notification appears to me to be the only remedy. There are several very strong supporters of this action in the ranks of our profession, and to name but three who have written on the subject, I would mention Dr. Kiven, M.O.H. Manchester, Dr. News holme, M.O.H. Brighton, and Dr. Philips of Edinburgh. By many authorities however it is still a question if public opinion is sufficiently advanced to accept notification - more especially if made compulsory - . In a leaderette in the British Medical Journal, expression is given to this latter opinion, it states, In contrast-

to the endeavour which is being made in this country to bring about the necessary measures for the prevention of tuberculosis by educating the public rather than by compulsion, the Board of Health of Trenton, New Jersey, U.S.A., has passed a number of regulations, which include the compulsory notification of cases of tuberculous disease, and the isolation of consumptive patients. Such measures may quickly stamp out consumption in the district affected by the regulations, by driving all sufferers from the disease to other districts. It may be doubted, however, whether they will do much towards the general prevention of consumption. Notification is desirable, and isolation is in some cases almost a necessity in the interests of the public health; but both will require to be very carefully applied in this country, and we may at least hope to avoid the compulsory isolation of all consumptives. If we are thus advised, in the middle of 1900, to deal with a gloved hand as here suggested by our leading medical journal, I am afraid it will not be during the present generation, at least.

Manchester Report on Tuberculosis. page 21.
2nd February 1899.

that the ravages of tuberculosis will be materially checked. Dr. Finckh - who as already stated is a strong believer in notification, and not of phthisis only, but all tubercular affections as well, which are in an infective stage - states: "It has been suggested that a system of voluntary notification should be instituted - It would certainly be better to have voluntary notification than to do nothing - But it should be stated that not to make notification compulsory will place those medical men who are impressed with the necessity for action at a grave disadvantage. A medical man cannot report cases of a disease, when his neighbours are not doing so, without running the risk of losing his patients. He is, however, in a very different position if there is a legal obligation upon him to report all cases. Then, again, with a partial system of notification, we should not obtain the same information in regard to the causes of the disease as we should if notification were general and tolerably complete." I can add my testimony to every word of this statement, and before the

present notification of infectious diseases became compulsory in Scotland, I have lost patients by notifying such infectious cases voluntarily. But conscientiously with a view to the benefit of the public at large, & just as Dr. Miron here states would take place with the voluntary notification of tuberculosis. At page 5 of this Manchester Report, Dr. Miron gives an instance of how benefit could be obtained from notification, "There is a large School in this City in which the children are very closely packed in the dormitories, which, however, are kept in a state of admirable cleanliness. Many of these children are far from robust. If any one shows the slightest sign of tuberculosis he is immediately removed. They must frequently suffer from illness in one form or another, yet tuberculosis is very rare amongst them. The sources of infection are not allowed to remain -

~~The~~ New York - where notification of tuberculosis in a voluntary form has been in force since 1893 with much benefit - has now made notification

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compulsory; the Section (225) of the Sanitary Code is; "That pulmonary tuberculosis is hereby declared to be an infectious and communicable disease, dangerous to the public health. It shall be the duty of every physician in this city, to report to the Sanitary Bureau, in writing, the name, age, sex, occupation and address of every person having such disease who has been attended by, or who has come under the observation of, such physician for the first time, within one week of such time. It shall also be the duty of the commissioners or managers, or the principal, superintendent or physician, of each and every public or private institution or dispensary in this city, to report to the Sanitary Bureau, in writing, or to cause such report to be made by some proper and competent person, the name, age, sex, occupation and last address of every person afflicted with this disease, who is in their care or who has come under their observation within one week of such time. It shall be the duty of every person sick with this disease, and

of the authorities of public and private institutions or dispensaries, to observe and enforce the Sanitary rules and regulations of the Board of Health for preventing the spread of pulmonary tuberculosis".

In New York there is no muzzling of matters when the necessity for action occurs, and yet the Medical men of New York have heartily fallen in with these restrictive measures, and much benefit in the reduction of the tubercular death-rate is manifest.

Advanced cases of Phthisis to which we previously made reference can only be discovered through notification. Such poor sufferers - as a rule - are not made welcome in our infirmaries, as their residence, when once admitted, may be so prolonged, and the termination of the case is so generally an addition to the average death rate. These poor creatures often refuse to go to the Poorhouse. From want of work, their circumstances steadily become reduced, and their residence must also be changed to one of smaller rent. Their family connections under

the same roof become infected, and the house or houses which they severally occupied also get infected, and becoming fresh foci of the disease, spread disease and death among the succeeding residents. This statement is far from being chimerical, for Dr. Flick of Philadelphia and Dr. Rensselaer of Manchester both showed long ago that phthisis has a special affinity for particular groups of houses, in which it keeps recurring.

When we obtain notification, our Sanitary authorities must arrange for the bacteriological examination of all sputum, and if the examination declares the presence of the tubercle bacilli, the medical attendant should be, at once, required to notify the case; this bacteriological examination can be done by the medical attendant if he so desires, but the presence of the bacillus should be essential to the receipt of a notification fee, otherwise the expense would be much increased and bring the proceeding into disrepute.

On receipt of a notification certificate, the

Medical officers of Health should first communi-
 cate with the notifying practitioner, and if he makes
 no objection - the only objection to be accepted
 should be the carrying out of this instruction him-
 self - a visitor should be sent conveying
 printed instructions to be left behind, and giving
 any viva voce directions compatible with a
 non-interference with the purely medical
 treatment of the case. Particular directions
 must be given regarding all expectorated matter,
 and domestic and out of door spittoons should
 be provided free of charge. The patient should be
 recommended not to frequent public gather-
 ings especially in gas heated assembly rooms.
 He should be encouraged to be as much out
 of doors as possible, and if any rag is used for
 the spit instead of a pocket spittoon, it
 should be burned as soon as convenient.

In the event of a change of residence, or on the
 occurrence of death, intimation should at
 once be made to the Sanitary authorities, and

it should be an unbreakable rule, that the room or rooms regularly used by the consumptive should be thoroughly disinfected and if possible lime washed before being again occupied. If these, and other similar suggestions could be inaugurated in all cases of Tuberculosis a most material diminution in the number of such cases would soon become apparent.

(18th) "The extension and cheapening of travelling facilities by which even the comparatively poor workers in our great towns can establish their homes, and rear their families outside the central zones of smoke, fog, and foul air". After what has been said of the necessity of an open air life as being the natural heritage of man, where he can enjoy freedom from dust and smoke, and have no artificial covering all day save the blue vault of heaven, it seems almost unnecessary to say more on this eighth head. The necessities of life are such, that a man to work must go to where the work is to be obtained,

as work cannot always be obtained where a man might want to obtain it. Consequently our people congregate around our large manufacturing establishments, and if great care be not put forth, overcrowding and other sanitary defects so prolific in the propagation of tuberculosis soon become manifest. In many of our large manufacturing establishments, the price of land required for extensions is so great, as to compel removal to the country, and in this way relief to overcrowding may be obtained. In Glasgow - which is always foremost in benefiting its people - in connection with many public works, such cheap railway fares are already in force enabling the workers to reside in the country, and yet maintain punctual attendance to the early hours of work.

The cheap half holiday shopkeepers return fare, and the cheap "Saturday to Monday returns" are great boons to our toiling workers. Much is also done by the charitable in providing the youthful occupants of our slums,

with a week or two in the country during summer, and thus enabling them, perhaps for the first time in their lives, to see the grass and wild flowers growing in Nature's garden.

In concluding this thesis, I trust the time will soon come, when any one choosing Tuberculosis as the subject of his choice, will have the satisfaction of referring to it - as we do now of Typhus Fever once so prevalent - as a blot on the sanitary perfection of our Municipal authorities.

