

TUBERCULOSIS—INFECTION THROUGH MILK AND THROUGH BAD SANITATION.

Read before the Iowa State Medical Society, April 15, 1896.

BY W. E. HARRIMAN, B.S., M.D.

PROFESSOR OF PATHOLOGY, HISTOLOGY AND PHYSIOLOGY AT IOWA STATE AGRICULTURAL COLLEGE.
AMES, IOWA.

In the JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION of Feb. 8, 1896, Dr. Edward F. Wells of Chicago announced the proposition that pulmonary tuberculosis is declining in prevalence, and supported the assertion by some very complete and carefully compiled statistic tables. These statistics seem authentic and it is hard to doubt the conclusions; yet our journals and periodicals in general are filled with startling statements of its prevalence.

Dr. J. Collins Warren, professor of surgery in Harvard University, says that tuberculosis probably affects more people than any other form of infectious disease, and estimates that one out of every five deaths is due to this disease.

Professor Law of Cornell University is quoted in Vol. xviii of *The American Veterinary Review*, as having said: "If the 5,490 deaths from tuberculosis which occur every year in the city of New York could be brought together in an epidemic lasting but one week, no smallpox, cholera or yellow fever scare would approach the panic which would thus be created."

From various statements we glean that the average ratio of deaths in the human family from tuberculosis, to the total mortality, is about 14 per cent., while in some localities it reaches as high as 40 or 50 per cent. Professor Law says "if we take the whole civilized world and compare with the tuberculosis mortality all the accumulated deaths from war, famine, plague, cholera, yellow fever and smallpox, we find that the latter wanes into comparative insignificance."

These astounding statements from men of national reputation, must carry no inconsiderable weight. Such appalling mortality as is here depicted enlists our interest in a search for the potent causes, and we find that it is a disease both of man and lower animals; that it is communicable from the one to the other; in fact, that it is intensely infectious, and in a plain sense contagious; that the conditions under which conveyance and transmittance of the infection occur, are numerous and variable in the extreme, and that once contracted it is terribly fatal. These complex conditions unite to cause the high mortality.

Of the various avenues whereby the tubercle bacilli gain entrance to the human economy, one of great importance is via the gastro-intestinal route.

As has been said, the disease is communicable from man to the lower animals and *vice versa*. Of all the lower animals, cattle are the most commonly affected; especially is this true of milch cows, and although Sims Woodhead finds some difference in the vital pathogenic characteristics of the two bacilli, recent investigation proves that bovine tuberculosis, or *Perlsucht* as the Germans call it, and human consumption are identical.

Fleming in his "Manual of Veterinary Sanitary Science and Police," in speaking of its geographic distribution among animals says: "Tubercular phthisis or tuberculosis probably prevails among the domesticated animals over the entire globe." In Mexico 34 per cent. of the animals slaughtered for food are found to be tubercular. In Europe and England it is exten-

sively present and has long been recognized as a common disorder among animals.

In the United States it is prevalent from shore to shore. Dr. Simonton in an article in the *San Jose Mercury* of January, 1896, states that 15 per cent. of the cattle in California are infected, while reports by the Cattle Commission of Massachusetts give the percentage in that State variously from 8 to 35. From results of tuberculin tests thus far made, the percentage in Iowa is from 12 to 14. We can safely put the average throughout the United States among cattle from 5 to 12 per cent.

Hence the question of infection of man through animal products assumes a colossal importance. Of all the animal products milk, being used so extensively in the raw state, is by far the most dangerous.

In the report of the Royal Commission on Tuberculosis in the *American Journal of the Medical Sciences*, September, 1895, experiments are reported in which pigs, guinea pigs and rabbits were fed on uncooked milk from tuberculous animals, and the disease was thus caused in a very large percentage of subjects used. Control experiments with animals kept under similar conditions but which received no tuberculous food, gave negative results. The uncooked food produced the disease in all of eight pigs, all of five cats, fifty-six out of eighty-four guinea pigs and eight out of ten calves that were fed with it. Prof. W. M. Late Coplin of Vanderbilt University, Nashville, Tenn., reports experiments with similar results. Dr. Palmer of Massachusetts reports equally conclusive tests. In experiments made at our Iowa Agricultural College over 60 per cent. of the animals fed upon the condemned milk contracted the disease.

In the human race it is known that children are most frequently affected with intestinal tuberculosis, and the *American Veterinary Review* of December is authority for the statement that over half the deaths of bottle fed children in cities are due to tuberculosis.

From all the above statements, we must conclude that the possibility of milk from tuberculous animals containing the infectious elements is undeniable.

It has been stated that only those cows having tuberculous udders are capable of producing bacilli in the milk. The unfortunate fallacy of this is shown by one of an exhaustive series of experiments conducted by the trustees of the "Massachusetts Society for the Promotion of Agriculture," quoted by Drs. Stalker and Niles in Bulletin No. 29 of I. S. A. C. Exp. Station, published in November, 1895; twenty-one healthy calves were fed on milk from tuberculous cows. At the conclusion of the experiment they reported: "Of the twenty-one animals, eight, or over 33 per cent., were shown to be tuberculous. That the cows from which milk for these feeding experiments was derived were free from tuberculosis of the udder is shown by an appended table of their history, and the results of the postmortem."¹

I am prone to believe, with the above society and Drs. Stalker and Niles, that "with the evidence here presented it is undeniable that milk from tuberculous cows with no appreciable lesion of the udder may, and frequently does, contain the bacilli of the disease."

Hence it is seen that milk from cows affected with the disease to any extent, whether the udders appear diseased or not, is very apt to contain the bacilli (and as a matter of fact, differential diagnosis during life

¹ Table not inserted with this article.

between tuberculosis of the udder and simple mastitis is often impossible).

When we consider the wide-spread prevalence of the disease among cattle, and the practically unrestricted public distribution of milk, and the enormous quantities yearly consumed in the raw state, we do not wonder at the high rate of mortality in the human race.

Sanitary science includes a consideration of all that can be done for the prevention of disease and promotion of the public health. The application of rules and enforcement of laws promulgated by this science is known as sanitation. If the sanitary rules are not rigidly applied, or the laws are disregarded, we have unfavorable or bad sanitation. The negligence shown in permitting the spread of tuberculosis by infected milk is bad sanitation. But more commonly we look upon the expression "bad sanitation" as meaning some condition of improper or inefficient sewerage or other menace to public hygiene.

The hygienic environments and state of sanitation have much to do with the tuberculosis problem, in so much as bad sanitation causes a lessened state of health and vitality, and hence renders the body easily invaded. Furthermore, conditions of filth and moisture, and decaying organic matter, such as is afforded for example, in some of the dark, damp, illy ventilated tenement houses of cities, are very favorable to the life and thrift of the tubercle bacillus.

No condition of bad sanitation can actually originate *per se* the germs, but various conditions of unfavorable sanitation are conducive to activity of the infection, which conditions, combined with some special predisposition on the part of the individual, result in his ultimate infection.

Perhaps the most frequent manner of infection in the human species, even more so than via the gastrointestinal route, is by inhalation of bacilli in the air, containing the dust of dried sputum expectorated unrestrictedly by tuberculous individuals. In the same manner, and from the same cause, public berths in sleeping cars and ships, cabs and other public conveyances are especially dangerous. Another source exists in use of contaminated water supplies, public baths, water closets, etc.

The practice of dealing in second hand articles, particularly clothing, is an especial menace to those so engaged. Along this line the Iowa *Health Bulletin* of November, 1895, calls our attention to the matter of infection through the sale and use of bed mattresses made of old rags.

The common procedure among children in our public schools, of cleaning the slate by fingers moistened in the mouth, and passing the slate to the next neighbor to repeat the operation, is one especially calculated to spread such a disease as tuberculosis.

The sale of tuberculous meat and of fruit which has been exposed to street winds and bacillus-laden dust are also matters of no mean magnitude in the spread of the disease.

In fact this disease has been transmitted from man to man, man to animal, animal to animal, animal to man, from place to place, until it would seem that man's life continues at constant hazard, and his survival is a momentous marvel.

Indeed, I believe were it not for that mysterious something within us, which Sternberg has termed partial immunity or "natural resistance," the already high mortality must needs be multiplied many times.

For the conditions have now become such that no doubt many of us inhale or ingest tubercle bacilli every day of our lives, while only those hereditarily predisposed, or in whom natural resistance is at a low ebb, become favorite seats for the development of the germ.

Woodhead has summed up these conditions necessary for infection as follows:

1. The presence of the bacillus tuberculosis in such a position and for such a length of time that it obtains a coign of vantage, so to speak, from which to attack the tissues of the body.

2. Some weak point in the epithelial surface, made by disease, or due to irritation or bad food, by which the organisms may attack the deeper tissues in sufficient numbers to insure their being able to hold their own in the struggle for supremacy that ensues.

3. The comparatively low vitality of these deeper tissues brought about by imperfect nutrition or irritation, the cells of which they are composed being no longer able to deal successfully with any large number of bacilli that can, under ordinary circumstances, find their way thus far.

Much has been done in various parts of the country toward controlling and preventing the spread of this disease, and our literature today is replete with conflicting plans for its complete eradication. A résumé of what has been accomplished and a discussion of the floods of contributions to our literature, on the subject, would be of intense interest and profit.

CHURCHILL'S METHOD APPLIED WITH SUCCESS IN FORTY-FIVE CASES OF PHTHISIS PULMONALIS.

BY T. BLANK, M.D.

ST. LOUIS, MO.

Too little attention is paid to "Churchill's method" of treating consumption, although it is still the best method, and if well studied and rightly applied will result in a cure in a great many cases. We can not expect much good from it at the last moment; it must be applied early. In the incipient stage and in the beginning of the cavernous stage, ninety cases out of a hundred can be cured by the Churchill method. But the physician, in order to succeed, must study it closely. He must be a good observer, otherwise he will fail or do harm. The Churchill method depends upon phosphology; if there is a decrease of molecular or intra-organic combustion, due to want of phosphid (oxidizable phosphorus) element in the bioplast (or bioplasmic principle, as Churchill calls it), then the tissue breaks down and the soil for the tubercle bacilli is prepared.

That the tubercle bacillus is the cause of tuberculosis no scientific man will deny. But considering the wide distribution of the tubercle bacilli and the many chances for infection, it is really wonderful that so many escape the disease. Koch himself drew attention to the slow growth of the tubercle bacilli, so that in many cases they are eliminated before they have gained a foothold.

Now we come to the point. What is the condition that favors a foothold of the tubercle bacillus? It is the deficiency of the phosphid (oxidizable phosphorus) element. If this element is not present in sufficient quantity in the tissue the oxygen we inhale with the air is not utilized to the fullest extent, owing to a lack of oxidizable phosphorus in the organism