

The history of a tuberculous herd of cows / H. L. Russell.

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Russell, H. L. 1866-1954.
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Publication/Creation

Madison, Wisc. : University of Wisconsin, August, 1899.

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UNIVERSITY OF WISCONSIN.

Agricultural Experiment Station.

BULLETIN NO. 78.

THE HISTORY OF A TUBERCULOUS HERD OF COWS.

MADISON, WISCONSIN, AUGUST, 1899.

The Bulletins and Annual Reports of this Station are sent free to all residents of this State upon request.

NOTE.—Bulletin No. 77, entitled "Effects of the February Freeze of 1899 upon Nurseries and Fruit Plantations in the Northwest," was not sent to the full mailing list. Copies of this bulletin will be sent upon request, so long as the supply on hand holds out.

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THE HISTORY OF A TUBERCULOUS HERD OF COWS.

H. L. RUSSELL.

A TOO FREQUENT EXPERIENCE.

Eight years ago a thrifty farmer in one of our eastern counties decided that he could have better cows than those which he then possessed. When he reached this decision, he did not sell all that he had, and buy new ones to take the place of the old herd, but he purchased a few pure bred animals that he had reason to believe were better milk-producers than those which he originally possessed. With this influx of new blood, he started as thousands of dairymen have done to "build up" a herd by gradual selection of the best animals.

When the purchase of these animals was made, he paid for registered cows, and thought that this was to close the bargain; but, unfortunately, such was not the case. With these pure bred cows, he introduced into his herd, a microbe, which, later, was to increase and spread throughout his herd to such an extent as to seriously threaten the success of his whole enterprise. The germ in question was that of tuberculosis, and undoubtedly, some of these animals had in a latent form, the seeds of this disease in their systems, as later they were the first to succumb.

At the time of purchase it was practically impossible for this buyer to determine whether any of his herd was affected or not, for the diagnosis of this disease in the beginning stages was then confined to merely a physical examination, and even the most thorough expert could not be sure of its presence in the earlier stages. If this breeder were to repeat this experience at the present time, it would be a comparatively easy matter for him, to determine by means of the tuberculin test whether any of his animals were affected with this disease or not.

This test can be so easily applied, and especially in the earlier stages of the disease is so much more reliable than any other method of diagnosis that no one should run the risk of buying tuberculosis when they bring new cattle into their herds. The use of this test is, however, not so widespread as yet, but that one must generally insist on a "tuberculin certificate," if they are to secure its advantages. Breeders will not be in a hurry to test their herds, if prospective purchasers do not insist on "tuberculosis-free" animals. Indifference and failure to recognize its value are the main reasons why the test has not already been more widely employed that it has.

HISTORY OF THE OUTBREAK OF THE DISEASE.

When this pure bred stock was first bought, it was kept apart from the balance of the herd, but in 1894, three years later, the herd was re-divided on the basis of age, all young animals being kept together on one side of the barn, while the mature animals were stabled on the other. The history of the herd for a time presented no unusual feature. The more promising calves were raised, and so the herd was gradually improved.

In 1895 some of the pure bred cows began to fail, and in that and the following year, two of them died of what later was determined to be tuberculosis. The owner at this time was ignorant of the true nature of the malady, as the slow wasting away of the animals had not especially impressed him. When the true character of the disease was determined by a post-mortem examination, a tuberculin test of the entire herd was at once made, under the auspices of the Experiment Station, and the surprising fact established that with three exceptions (13 out of 16), all of the mature animals in the herd reacted. In addition to this three head of young stock also responded to the test.

THE CONTAGIOUSNESS OF THE DISEASE.

The contagiousness of the disease is evident in this history if one can rely on circumstantial evidence. Of course it cannot be positively asserted that the trouble was introduced into the herd with the purchase of the pure bred stock, but this theory is in accord with the most facts. No disease of this character had ever been noted in the herd before, and when it did occur, it attacked the pure bred animals first, and subsequently, those which had been most in contact with these. Supposing that some of the original cows were infected with the disease at time of purchase, it is probable that the malady was disseminated among the mature animals from 1894 to 1896.

In this brief space of time, the outbreak had spread so that nearly every mature animal of the herd was more or less involved. All of this had happened practically unbeknown to the owner. Could there be a more striking example of the insidiousness of the malady than this? Does it not show to the breeder and the dairyman that the appearance of an animal is no sure index of its actual condition? The recognition of this fact alone should lead cattle owners to use the test for their own protection. When the true state of the herd was recognized, what was to be done?

COURSE TO BE PURSUED.

Here was a herd with every breeding animal except two tainted with tuberculosis. According to the strict letter of the law, every one of

these animals should be killed. From a legal point of view, in this state, and in many others, it makes no difference as to the extent of the disease in the animal. Before the law all reacting animals are classed alike, and condemned to die. The manifest injustice of such a method of procedure is apparent at once to any one who is familiar with the course of the disease in the animal. In the strict sense of the word, all animals that react to the tuberculin test are affected with tuberculosis, but as Theobald Smith has so well pointed out, many animals that react are not diseased in the ordinary acceptation of the term. They may be called infected, as he says, but generally, they are not dangerous, so far as disease dissemination to either man or beast is concerned.

Animals affected in the earlier stages, but kept under favorable hygienic conditions will frequently live for years without the disease making any apparent headway in their systems. The progeny of such animals is scarcely more apt to have tuberculosis at birth than that of non-reacting mothers. If such calves are removed from an infected atmosphere, placed under good hygienic surroundings, and fed on tubercle-free food, they will not show any taint of this disease.

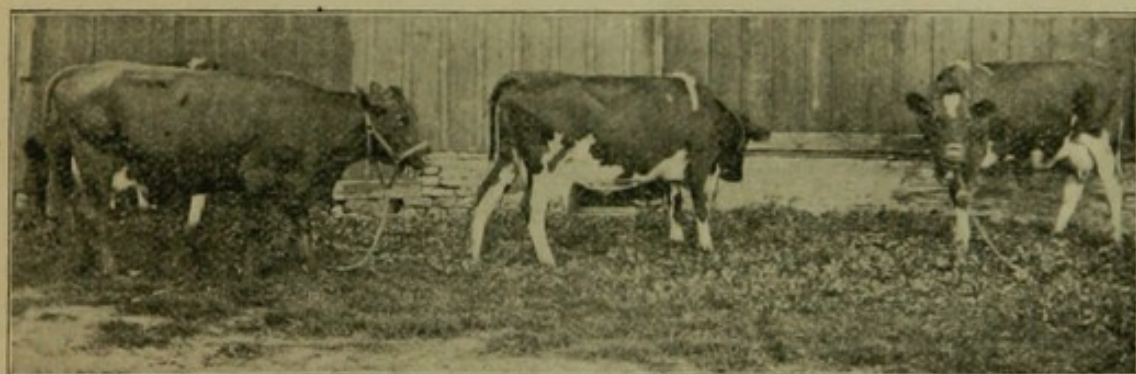


FIG. 1.—A bunch of tuberculous cows.

Were it not for the tuberculin test, frequently the presence of the disease would hardly ever be recognized in animals of this class. This point receives striking confirmation, if one will note, as shown in fig. 1. the appearance of some of the cows that have been tuberculous for several years. To destroy such, in order to eradicate the malady, often wipes out of existence not only large money values, but what is of far more importance, it may needlessly destroy the labor of years spent in careful and selected breeding.

Let us suppose that a breeder has been engaged for years in building up a strain that is noted for several points of excellence in some one direction. Kill the herd on which these years of labor have been put, and you destroy the actual capital involved in the animals in question, but the potential values that are lost are much greater, for money alone cannot replace these in any way.

So long as the disease was considered as absolutely incurable, so long as it was believed that the only way in which it could be effectively stamped out was by slaughtering all animals that reacted at all, this method of wholesale slaughter was justifiable in a sense, because it is the part of wisdom to be on the safe side in matters pertaining to public welfare. When, however, it was definitely shown that a reaction to the tuberculin test did not necessarily mean that the dairy products from such an animal were dangerous to human health; that it might be perfectly safe, under certain conditions to keep such an animal itself in the herd for even years, then the need of compulsory slaughter of every reacting animal became less evident.

With the increased knowledge that has come from a more thorough study of the course of the disease in the bovine race, new methods of treatment have gradually been evolved. These have differed slightly in different countries, owing to the variation in conditions, but the same general principle is operative in the various methods that are now being inaugurated.

CONTROL OF TUBERCULOSIS BY QUARANTINE.

The principles of this method are briefly these:—

Separate at time of test, all reacting from non-reacting animals, keeping them practically as two independent herds. Breed these reacting animals under careful conditions, separating the calves at birth from their mothers, feeding them on thoroughly pasteurized milk of reacting cows (or milk from non-reacting animals.) All healthy cows, and calves from both affected and healthy sections should be kept in quarters known to be free from tubercular contagion. The disposition of the product of the reacting herd may be varied to suit the exigencies of the occasion, but in any case it should be treated by pasteurizing so as to render it innocuous.

Believing that it was possible in this case to restore the herd to a perfectly healthy condition, and that it could be done with less expense, where the above plan was followed, than it would be to kill all the animals that reacted and fill their places with other stock, this method was proposed to the owner and adopted by him.

ARRANGEMENT OF THE HERD.

The herd had been stabled in a basement barn of the usual type in which the ventilation was only fair. The animals were kept in stanchions, and were watered generally out of doors in a large tank, although there was a pipe inside from which water could be drawn in pails and given to the cows. A silo communicated with the stable at the end of the barn. The fodder was distributed to the cattle on either side of a central aisle.

The conditions were such as might be found on hundreds of farms throughout Wisconsin. No other building was available in which either the healthy or the affected part of the herd could be kept, and it was therefore necessary to arrange quarters in the original stable in some way, so as to prevent contact of one section of the herd with another.

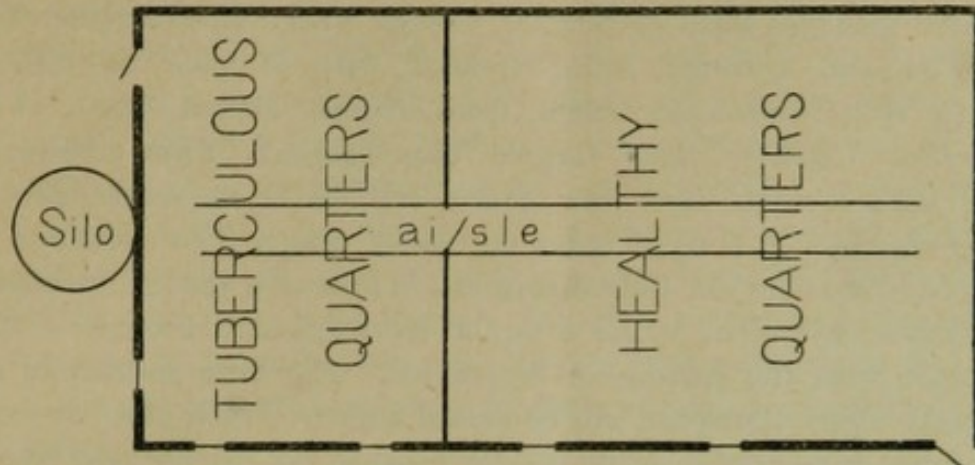


FIG. 2.—Ground-plan of barn, showing arrangement of herd.

This was done by throwing a partition made of single thickness of boards across the stable as shown in fig. 2. The two sections of the herd were pastured in separate paddocks and watered in different tanks. It was of course somewhat hazardous to allow direct passage between the two compartments, and also to bring the food for the healthy section through the room occupied by the diseased stock, but such an arrangement under the circumstances was the only practicable one that could be instituted.

DISINFECTION OF THE BARN.

Before the rebuilding of the herd was begun, it was necessary to thoroughly disinfect the whole stable,—a process that generally presents considerable difficulty on account of the character of the space to be treated. The bacillus of consumption usually finds its way into the air from the breaking down of the tissues of the affected lungs or glands. The cow does not expectorate, but at the same time, the disintegrated tissue, in which the tubercle bacilli are abundant is thrown out from the lungs, and in this way gains access to the air. Here it soon dries, and like any dust particle, may be easily set in motion by a slight air current, and so disseminated throughout the air of the stable. The inevitable result is that a barn occupied by tuberculous animals for any length of time is almost sure to contain the seeds of this disease on its walls and ceilings, but more particularly, in the mangers and stalls that have been occupied by the affected animals as here the contagious matter is more frequently deposited. One may conscientiously kill all reacting animals in their efforts to get rid of the disease, but if the barn in which

they have been kept is not thoroughly purged from all infectious matter, the introduction of a new herd, even though it passes satisfactorily the tuberculin test, is almost sure to acquire the disease from the inhalation of the dried bacilli in the dust.

In disinfecting the barn, all litter and loose material was first cleaned out so as to give better penetration to the disinfectant. Then the stalls and mangers were thoroughly washed with a hot solution of lye, the walls and ceilings being treated with a coat of milk of lime (a thin whitewash made from freshly slaked lime). There are other agents than these that might have been applied; indeed some that are more frequently recommended. In the disinfection of a tight room or closed space, two methods are available. One where a disinfecting gas is liberated that permeates the entire space; the other where a liquid disinfectant is brought directly in contact with the surface to be treated. The first method is only applicable where the space can be closed tightly. In a barn or stable, this method is generally of no service because the cracks and crevices are so numerous as to render it difficult to confine the gas. The direct application of a liquid is much more certain to be effective. Of the various substances that can be used, corrosive sublimate in the proportion of 1 oz. of the crystals to 15 gallons of water is often recommended. The addition of a few ounces of common salt intensifies its disinfecting power. This liquid should be mixed in wooden barrels or pails as it will corrode metals.

Crude carbolic acid is often used. The effectiveness of this agent may be greatly increased by mixing it with an equal volume of sulfuric acid. Care should be taken in pouring the sulfuric into the carbolic acid as a large amount of heat is quickly liberated by mixing these agents. This mixture should be diluted about twenty times (6 ounces of carbol-sulfuric acid to one gallon of water).

HISTORY OF THE TUBERCULIN TEST OF THIS HERD.

First tuberculin test. The first test was applied January 2, 1896. The results of this examination showed that thirteen out of sixteen mature animals responded, and that three yearlings were also affected. At this time two animals showed marked physical symptoms of the disease, and these were slaughtered, as it was thought unwise to leave them even in the affected herd. On January 10 the herd was divided into the two sections, and from that time to the present, these divisions have been handled as two separate herds.

Second tuberculin test. To make sure that no animals were left in the healthy section that might have the disease in the earliest stages, a second test was applied on May 12, 1896. The results of this test were identical with the first. Five calves had been dropped in the interim, four of these coming from the tuberculous section. These had been

separated at birth and fed on boiled milk, and at this test showed no reaction in any case. The majority of the bull calves coming from grade mothers were not raised but were sold for veal. At the time of the second examination the general appearance of the herd had materially improved when compared with its condition in the winter, although all animals that originally responded to the test did so on the second application.

Third tuberculin test. The third test was not made until nearly a year afterward, April 26, 1897. The results of this test were equally satisfactory. No new case of the disease had developed in any instance, and every calf from the tuberculous section as well as the other showed entire freedom from the disease. In a couple of the old cows, the disease had made such progress that it was evident that they were on the decline, and these were killed. The herd continued to increase in numbers, and in January, 1898, had reached such proportions that it became necessary to dispose of some of the animals on account of insufficient stable room.

PURCHASE OF AFFECTED ANIMALS BY EXPERIMENT STATION.

Inasmuch as the herd had now been under close observation for about two years, it was deemed expedient to purchase as many of the tuberculous section as possible, in order that the course of the disease in these might be watched to its ultimate conclusion.

Although the question of bovine tuberculosis has been quite thoroughly investigated for a considerable number of years, still there is lacking in a large measure, data as to the exact period of incubation of the disease in the animal, and also as to the possibility of recovery. At this time there were ten tuberculous cows left in the herd. Of these the Experiment Station purchased six, the owner promising to keep the remainder, which were registered stock, under the same conditions as before.

The six infected cows were isolated on one of the university farms, where they were kept in an ordinary stable which had rather poor ventilation.

Fourth partial tuberculin test. The continued testing of the entire herd having failed to show any further spread of the disease, it was deemed unnecessary to make the tests of the whole herd so frequently, so that during 1898, testing was confined to the young stock. During this period, two more of the original herd of tuberculous animals succumbed to the ravages of the disease. Natural death was not allowed to occur, but they were killed when they began to show unmistakable signs of decline.

Fifth tuberculin test. In February, 1899, a final round-up test of the entire herd was again made as the increase in progeny again necessitated the sale of some of the stock. This test gave the same general results as before, there being no increase in the disease whatever.

SUMMARY OF THE TESTS.

In order to present the actual figures showing the rate of herd increase, the results of the different tuberculin tests are summarized in the following table. These figures include the status of the herd at the different testing periods, but do not take into consideration the young calves which were not raised.

TABLE I.—*Record of repeated tuberculin tests made on a herd in which the progeny of reacting animals was separated from dams at birth.*

Date of test.	NO. OF ANIMALS AD- JUDGED BY TEST AS		NO. OF ANIMALS IN	
	Healthy.	Affected.	Healthy section reacting to subsequent tests.	Affected section not reacting to subsequent tests.
January, 1896.....	18	16		
May, 1896.....	21	14	0	0
April, 1897.....	30	13	0	0
February, 1899	64	7	0	0

The relation of the progeny of the tuberculous animals to that section is brought out more forcibly in the following diagram, in which the reacting animals are represented by the shaded area, the healthy stock by the unshaded portions. The complete check given to the spread of the disease is shown by the perfectly healthy progeny that descended from the non-reacting branch of the herd. The success of the method, however, is to be noted in the graphical representation of the originally tuberculous section. The number of diseased animals has been steadily lessened by the continued progress of the disease, but the young in *all* cases have stood the test, showing that the disease is contracted after birth rather than inherited from the affected dam. This relationship is shown more clearly in fig. 4, in which the entire history of every animal in the herd is delineated. The originally affected animals are shown by the red lines, the healthy by the black. The broken line represents in all cases, the male sex, the continuous solid line, the female. The fact that since this experiment was begun, every calf born in the herd has been free from tuberculosis is brought out forcibly by the black lines coming off from the red lines in the different years. In the majority of cases where bull calves were dropped, they were disposed of as veal, and this fact is shown by changing the heavy line to a "hollow" or double line. It is of course possible that these animals might have acquired tuberculosis later, but the fact that they were born free from

1896 1897 1898 1899
 1st INOC. 2nd INOC. 3rd INOC. 4th INOC. 5th INOC.

TWO YEARS AND OVER

UNDER TWO YEARS

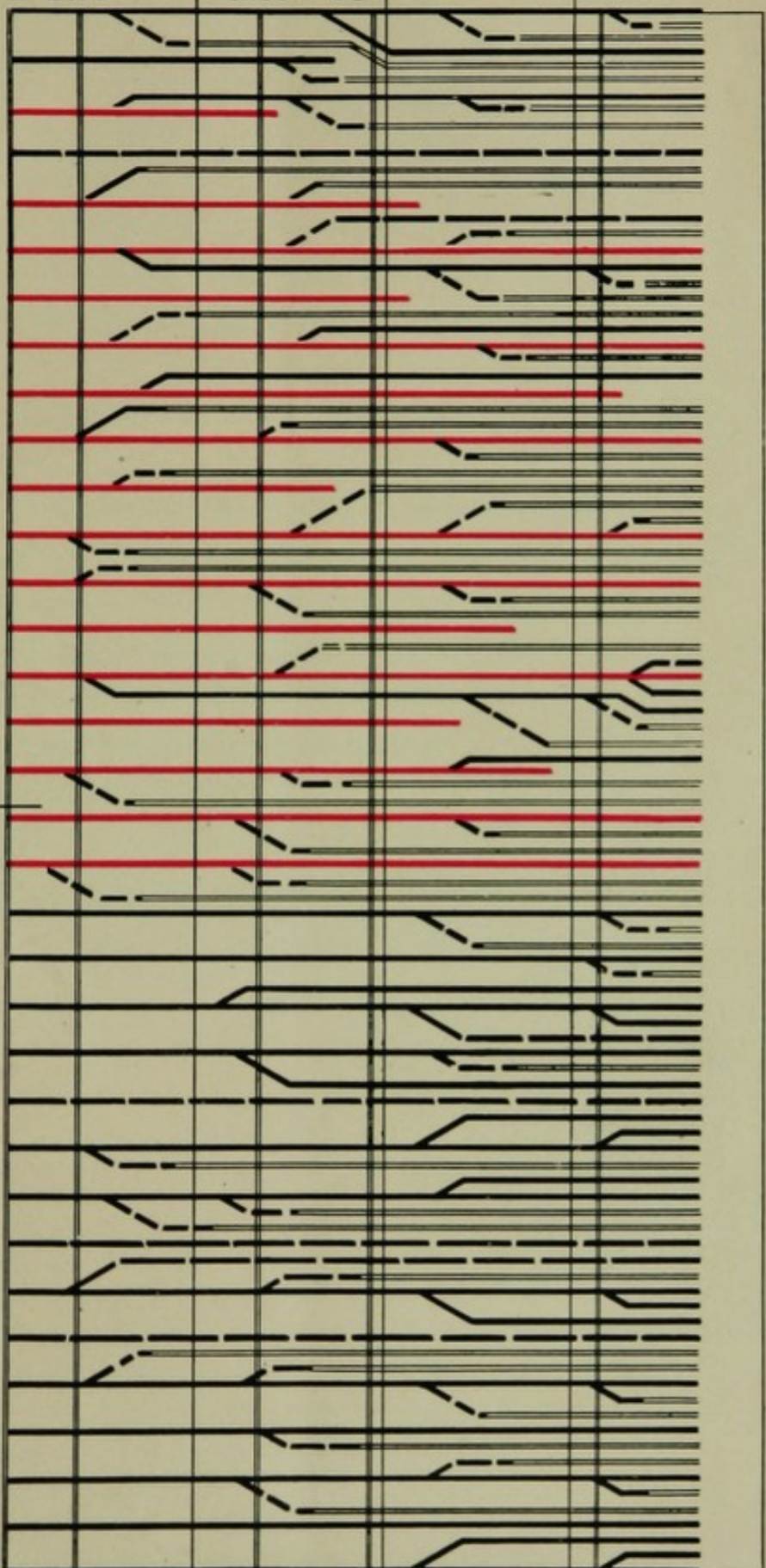
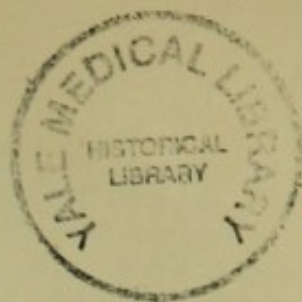


FIG. 4.—LIFE HISTORY OF EACH ANIMAL IN HERD AS TO ITS TUBERCULAR CONDITION DURING A FOUR YEARS' PERIOD. Tubercular animals in red, healthy in black. Cows in solid, continuous lines, bulls in broken lines. Young calves disposed of as veal are shown by changing heavy to double line. The herd is better off by 33 healthy calves from tuberculous dams than it would have been had the method of immediate slaughter been followed.



the disease, and remained so for several months before the test was made, indicates that it is possible to raise a healthy calf from an affected mother in the great majority of cases.

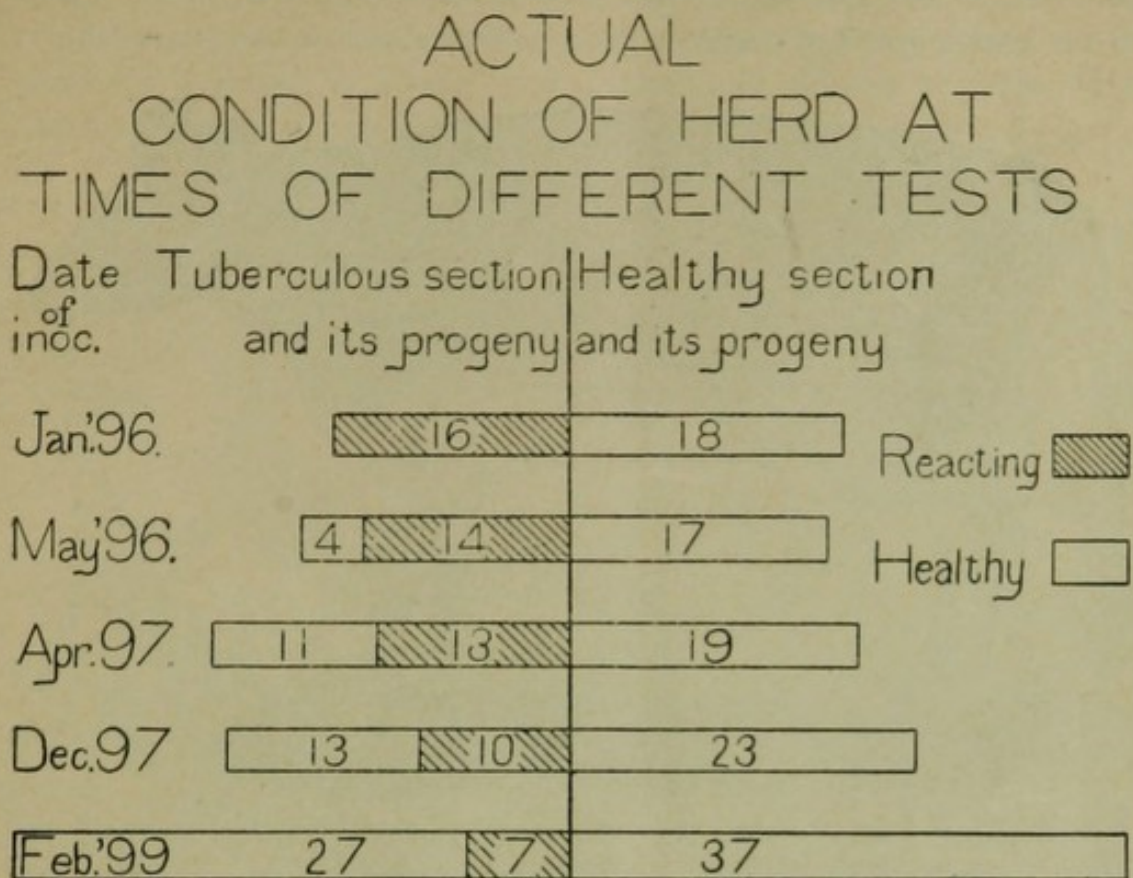


FIG. 3.

In no case did any of the animals originally pronounced tuberculous ever fail to react in any of the subsequent tests. This fact is somewhat peculiar, as it often happens that the continued introduction of tuberculin results in a failure to respond in some cases. Even where no response occurs, one cannot be sure that a cure is effected, for the oft repeated injections of tuberculin decreases the susceptibility of the system to the agent used.

COURSE OF THE DISEASE IN THE INDIVIDUAL ANIMAL.

One of the striking facts that has been noted in these investigations is the way in which the disease seems to progress in the individual animal. Aside from the five original cows which were bought, the presumption is strongly in favor of the theory that the other animals acquired the disease subsequent to 1894. By 1896 two of the original cows had died. Of the sixteen affected when the first test was made, several were killed for demonstration purposes. In 1896 and 1897 four had to be destroyed on account of the progress of the disease; in 1898, two more broke down, and so far in 1899 still one more has succumbed. Fig 5 shows the appearance of one that was failing fast when she

was killed. The seven of the original sixteen that now remain are apparently healthy and aside from a very slight cough, show no visible symptom of the disease. The photographs of some of them attest this fact. In these cases the disease has persisted for nearly four years to our knowledge, and probably for a period of one to two years longer.

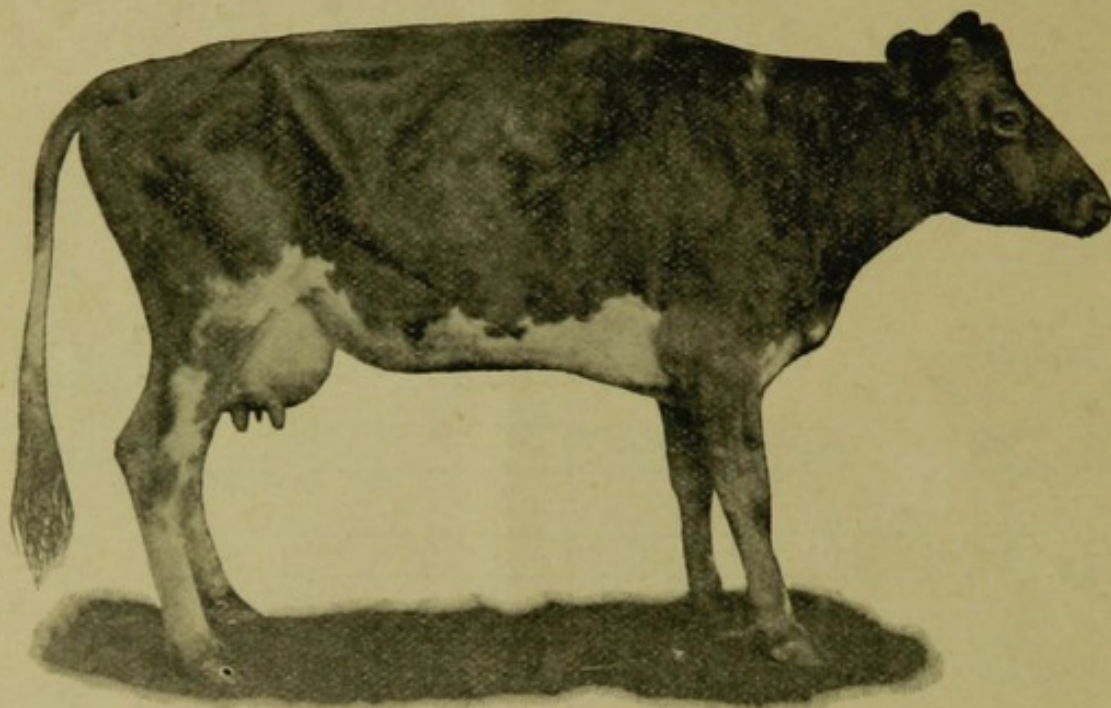


FIG. 5.— A tuberculous cow in the later stages of the disease. Two months before this picture was taken, this cow was apparently as healthy as any of the herd.

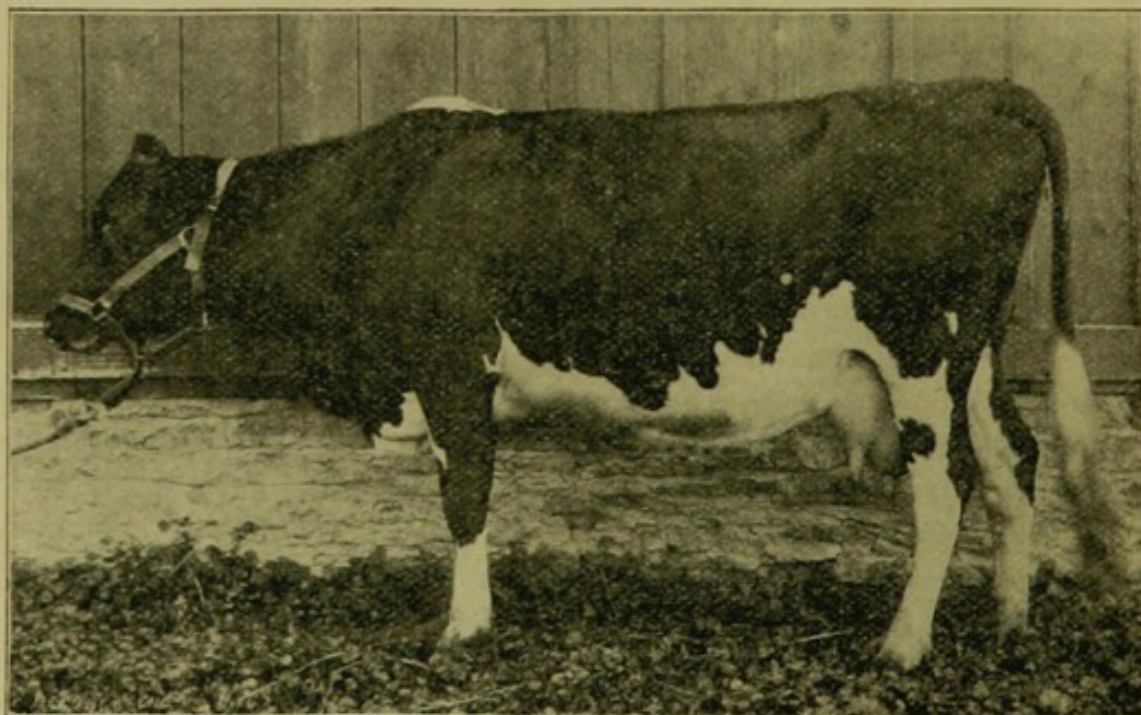


FIG. 6.— A tuberculous grade Guernsey. One of the best producers in the herd.]

In these cases the animals now eat well, show no tendency toward wasting away, and so far as an ordinary examination might go are apparently sound. How long they will remain so is one of the problems which we propose to solve by keeping them until they die or recover.

If it is possible to keep a reacting animal under ordinarily good conditions for a period of several years, then it is possible to build up a healthy herd on a diseased foundation.

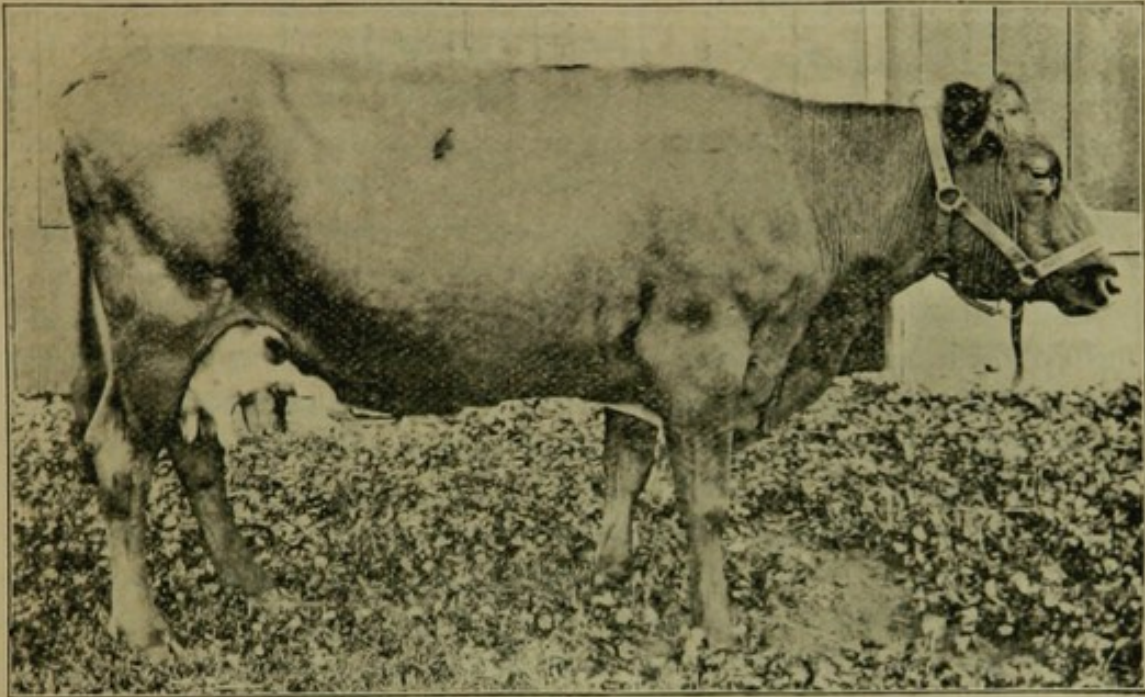


FIG. 7.—An apparently healthy but reacting cow that has had tuberculosis about five years.

It is noteworthy in those cases in which the disease has gained the ascendancy over the animal that the decline has generally been rapid toward the last. The animal has maintained herself in good condition until some set of causes has thrown her from a chronic latent tuberculosis into an acute stage. The intense cold of last winter hastened this change in one case; in two other instances the inciting cause was evidently the strain of calving. A fact of great practical value is that the diseased condition generally remained comparatively quiescent for a number of years, the resisting powers of the body being able to hold the disease germ in check; then a sudden turn for the worse occurred, generally as a result of some external inciting cause.

POSSIBLE DISTRIBUTION OF DISEASE BY THE HERD.

The milk of this herd of cows has been submitted to frequent examinations in order to determine the possible presence of the disease germ, but so far, we have always failed to find tubercle bacilli, although generally, they have been detected in control examinations where small quantities of tuberculous sputum have been added to the milk as a check upon the accuracy of the methods of examination.

Moreover, feeding experiments have also been carried out with this herd to determine whether these animals were able to impart the disease to others. Calves from tuberculous mothers as well as progeny from non-reacting animals have been allowed to suckle several of the reacting animals; also healthy young cattle have been kept in contact with the affected herd in stable and pasture to see if they would acquire the disease by ingestion or inhalation. In no case, however, has the disease been contracted by any animal either where cohabitation or suckling was allowed. This signifies that where the disease is not generalized, even though the animals may have reacted for some years that the danger of propagation was but slight, and therefore, such animals should not be regarded as positively dangerous, but only potentially so, inasmuch as the disease may possibly develop to such an extent as to become a source of danger to those about them.

As a precautionary measure from the standpoint of public health, the milk of such animals should doubtless be treated so as to deprive it of any possible infectious properties. This can readily be done by pasteurizing it at a temperature ranging from 140° to 155° F. or even higher, for a period of 40 minutes, or less, depending upon the heat employed. Such a treatment does not impair the milk for direct consumption or for butter, although the use of the higher pasteurizing limit will render it less suitable for cheese purposes.

That this method of handling tuberculosis is practical, and in many cases desirable, this experience as well as that of others abundantly verifies. Certain it is, that such a method looks at the question from a broader point of view than where the reacting animal is immediately sacrificed, regardless of all conditions. The method of eradication by immediate slaughter approaches the question from a single view point; the other procedure recognizes a bad condition, but instead of throwing up the whole matter, and beginning at the foundation again, it attempts to save time and values by using the discredited herd as a foundation on which a perfectly healthy progeny can be raised. Then the original herd can be sacrificed, after its good qualities are perpetuated in the progeny.

The one method is apt to array the owner against the health official, representing the public weal; for, in the owner's judgment, immediate slaughter is hardly justifiable, unless the state stands ready to fully compensate him for his loss, which policy would be repudiated by any commonwealth on account of its excessive cost. The other method unifies the two interested parties, the owner and the guardian of public health, because it points a way to the dairyman or breeder that enables him to eradicate the disease with a minimum loss while at the same time, the possibility of disease dissemination by milk and meat can be safely controlled.

The data here detailed is of considerable interest on account of the

length of time that has been covered and the thoroughly successful results that have been reached under ordinary conditions. Their value is somewhat enhanced by the fact that the experiments have been carried on, not under ideal conditions, but in the same environment in which the disease was contracted. It shows therefore that the effect of unfavorable surroundings of the animal can be minimized, if the tubercle organism is positively excluded from the same. The partial failure that is frequently to be noted where this method has been tried is generally traceable to imperfect disinfection of barns or incomplete separation of herds.

RESULTS COMPARED WITH WORK OF OTHERS.

The method here followed has come to be known as the Danish method, because under the energetic leadership of Prof. Bang, the government veterinarian, it has been thoroughly tried in Denmark. Bang's numerous experiments indicate that the disease can be "weeded out" in a practical manner. At the present time the Danish law is such that the government supplies the tuberculin and makes the test gratis, provided the owner will separate his herd on the basis of the results of the test. The sale of reacting animals is prohibited except for immediate slaughter, which must be done under authorized veterinary control, the meat being used under certain restrictions, if not wholly condemned. Owing to the extensive spread of the disease among Danish cattle, all skim milk returned to the farm must be heated to a temperature that will surely destroy the tubercle bacilli. Since the introduction of this regulation, the percentage of the disease in calves has fallen from 15.5 per cent. in 1895 to 10.6 per cent. in the years 1896 to 1898.

The results of Bang's tests were recently presented to the Congress for the Study of Tuberculosis (Paris, 1898). In the case of twenty-three herds here reported, none were so successfully controlled as in the instance here detailed. In every herd in which he tried this method, a varying number of animals were found that reacted positively to subsequent tests. These partial failures, amounting in all cases to about 12 per cent., he attributes to carelessness in maintaining complete separation of reacting from healthy herds.

This same general treatment has also been followed in Norway and Sweden with good results. The Royal Commission of Great Britain appointed to thoroughly investigate this question recommended a similar course. The opinion of students of this question is that this method offers a more rational method of treatment than that of immediate slaughter, and therefore, our laws should be so modified as to permit its being used under such supervision as experience shows necessary, for no one would claim that the interests of public health would be maintained unless some regulation by the state was enforced. It seems highly probable, and the experience of various European countries is

beginning to teach us the same story, that the eradication of, or holding in subjection, the scourge of bovine tuberculosis can be more economically and more thoroughly performed if this method is sometimes used than where a compulsory tuberculin test is authorized and all reacting animals slaughtered as was attempted in Massachusetts.

WHEN SHALL THIS METHOD BE EMPLOYED?

The objection may be raised against this method that it is unwise to permit animals to remain alive that may in any possible way endanger public health, that the method here detailed involves too much supervision. Such a generalization in the abstract is permissible, but the evidence is constantly accumulating that indicates that a reaction to the tuberculin test does not necessarily mean that the affected animal is dangerous at the time. No one will deny but that the possibility of danger is present, that an animal affected with the disease, even in the latent form, is less desirable than a perfectly healthy animal, but inasmuch as it is already practical to completely destroy the seeds of disease in the milk by pasteurization, it would seem unnecessary to destroy valuable animals that react to the test until it has been possible to perpetuate their good qualities in offspring that is perfectly healthy.

This method entails considerable work, and of course some extra expense, and the question must be raised in each individual instance, which process of eradication shall be used, for there can be no question but that earnest endeavors should be made to eradicate the disease in some way or other as soon as its presence is recognized. Whether all reacting animals are slaughtered at once, or whether some or all are separated and kept for breeding purposes, will depend upon the conditions that surround each case.

If a tuberculin test shows a single animal or comparatively few affected, then it is unquestionably good policy to exterminate the disease by slaughter, or in any event to remove the infected animals from the herd with the view of disposing of the same as soon as circumstances permit.

If on the other hand a tuberculin test of a valuable herd shows the disease to be present in a large number of cases, say a majority of the breeding animals, then the "weeding out" of the disease can be more economically done by quarantine and separation of tested progeny. Animals worth hundreds of dollars can well be saved for the healthy calves which can be secured from them. If after the herd has been built up to the desired number, by using the diseased foundation for breeding these healthy animals, then the original cows can be destroyed. They have served their purpose well, if they permit their owner to perpetuate their valuable qualities in healthy offspring.