about four months, as a rule. The cases where we have weaned earlier have been special cases, and after they were taking skim milk well.

Capt. Arnold—If you had a mare on your farm that had a lack of constitution, wouldn't you think it would pay better to use her and not breed her?

Supt. McKerrow—Yes, I would not want to reproduce any more of that kind; one would be bother enough. There are too many of that class already. That is one of the reasons I prophesy that horses are going to be high, because we have kept all the poor breeding mares, and sold the good ones.

Question—Are glanders brought in with Western horses?

Answer—Yes, I have good reasons to believe that they are, and greater care should be exercised in buying them.

The Institute adjourned until 1:30 p. m.

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AFTERNOON SESSION.

The Institute met at 1:30 P. M. Supt. McKerrow in the Chair.

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LATEST DEVELOPMENTS IN TUBERCULOSIS.

PROF. H. L. RUSSELL, Madison, Wis.

Mr. Chairman, Ladies and Gentlemen:—The question of bovine tuberculosis is one that is so new in this country that any consideration of it may well be made in a fundamental way. What I have to say on the question of bovine tuberculosis will be with reference to how we can detect it, and how this disease is introduced into our herds and how it spreads.

In the first place, let us start out with this question: Is this a fad or not? We often hear that suggestion made in the agricultural papers and otherwise, and the question is frequently asked, Why all this fuss and furore about a disease that we knew nothing about a few years ago? Is it anything but a fad? Is it something which you scientific men have gathered up and are trying to make stock of, perhaps for your own benefit, or is there really something in this question which merits thoughtful, earnest consideration of the agricultural colleges and other people?

While it is true that tuberculosis has been known in the human family for centuries, it is not true that it has been recognized as a matter of economic importance among livestock interests for more than a relatively short period of time. It is probable that tuberculosis has existed in cattle and in domesticated animals to a very small extent for a great many centuries, but it is only within the last thirty or forty years that the question has become one of economic value and the importance of this question is increasing steadily year by year. I want to present a few statements in regard to this matter, showing the increase of bovine tuberculosis, as it is found in several of the European countries. The method of collecting statistics in this country is so much poorer than in European countries that in order to determine whether bovine tuberculosis is making any headway in the world at large, it becomes necessary for us to go to Europe and see what the statistics there show in regard to this point.

Tuberculosis Across the Water.

In Germany in the Duchy of Baden in 1880, there was 1.6 per cent. of tuberculous animals found at the slaughter houses. In 1887 they had increased to 3.6 per cent. In the City of Berlin, the capital of Germany, in 1883, there were 2.8 per cent., whereas in 1895 there were over 15 per cent. of all animals killed, which were found to be
affected. This is from actual examination of the carcasses of the animals killed for the purpose of meat, so that it gives us an accurate determination of the amount and growth of this disease in these countries. In Saxony, the increase from 1888 to 1897 was from 5 to 29 per cent. In Holland the increase from 1888 to 1896 was from 1.7 per cent. up to 8.2 per cent., so you see that at the present time the disease is making very steady and rapid inroads upon the stock interests in various countries of the world.

Whether it is doing that in this country or not is a question which is not so easy to decide, for we have not the statistics to show it. I shall try to confine myself to what I know to be positive facts, not theories, but things which have been ascertained and determined in tests as nearly correct and accurate as it is possible for human observation to make them. The facts with reference to the growth of the disease in this country have been gathered in a fragmentary manner, because our methods are not as thorough and accurate as are those which are practiced in European countries.

In my judgment this question is not a fad, while it is a question that is becoming more and more important, it is a question which is well worth our earnest consideration as stock owners and stock raisers.

There are two phases to this question of bovine tuberculosis. There is that, first, which relates to the public health, and the development of this disease in animal life is a serious menace to public health, to the lives of children particularly.

Then, again, we can consider this question from the standpoint of the successful animal industry.

**Bovine Tuberculosis and Animal Industry.**

I will not have time this afternoon to dilate upon both phases of this question, and inasmuch as we are talking to people who are interested in growing and raising stock, we will confine our attention very largely to this phase which relates to the influence of tuberculosis as affecting successful animal industry. It is an impossibility for one to succeed in raising animals unless they are raised in a healthy condition, and the question arises with reference to this disease. Are we running a danger in our Wisconsin herds, in our dairy herds particularly, or in our breeding herds, for with this class of herds the danger is very much greater than in the class of animals that are raised for beef, because where animals are fed for beef they are not kept for such a long period of time, and the opportunity for the contraction of disease is not as great as where the animals are raised for the dairy, or for breeding purposes.

The difficulty with this disease of tuberculosis is just exactly as it is in the human being, it is in the fact that in the earlier stages it is almost impossible for one to recognize the disease with any degree of certainty. Very frequently one contracts a cold that runs along, it becomes protracted, he suffers from a hacking cough, and pretty soon the doctor says it is running into consumption. That simply means that the organism producing this disease has found its way into the human system and has established itself in the lungs, but is not recognized as a specific disease until it gets to the second stage of the disease. It is exactly that same way with the disease among cattle. The disease is the same in man and in the cow, or any of the domesticated animals, or even any of the warm-blooded animals, for all wild animals when confined are liable to this disease. The losses, for instance, in menageries and in zoological gardens, among animals kept in captivity, are mainly from tuberculosis, showing that all warm-blooded animals are liable to contract this disease if the circumstances are favorable.

**Diagnosis of the Disease by the Tuberculin Test.**

As I said before, the difficulty with this disease lies in the fact that it is so difficult to recognize it in its earlier stages, and if we had to rely at the present time upon the recognition of it by the ordinary physical methods of examination,—those which the physician uses, generally, in the detection of the disease in the human being,—detection of the disease in stock would be absolutely out of the question in any large percentage of cases that are really affected. But very fortunately, in addition to these methods of physical
examination which are used by the veterinarian or the physician in either the animal or human body, we have a test which now has been practiced for a period of nearly ten years, which has been tried and tested under all sorts of conditions, and the uniform verdict of those who have had the most experience with this test, which is known as the tuberculin test, is that while it is not an infallible test, not something which will diagnose the disease absolutely correctly under any and all conditions, yet when properly operated it gives by far the best results that have ever yet been found, results which are so far superior to the ordinary physical methods which we were obliged to use until the introduction of this test, that this method has now come to be preferred to any other method of examination. It is possible for mistakes to be made by means of the tuberculin test, and undoubtedly they have been, but I will say right here that the majority of the mistakes are not attributable directly to the test, but in applying it in the wrong manner, applying it under conditions where it ought not to have been applied.

The test is extremely simple to apply and at the same time accurate, does not even affect the flow of milk under ordinary conditions, except in a very, very small degree. In case of the animals that respond to the tuberculin test, the flow is sometimes modified for one or two milkings, but no more than would frequently happen under ordinary conditions, such as changing milkers or some other condition that might occur in the management of the herd.

In this method we have a means of determining whether our stock is affected with this disease or not, and I wish to advise all of you who are interested in this subject, to apply it in your own herds, for it is only by such application that it becomes possible for us to determine whether our animals are affected in any stage of the disease whatever.

The question will be asked as to whether animals may not respond to the tuberculin test which may show no physical symptoms of the disease, and that is true, and that, by the way, is one of the greatest advantages, for it is absolutely impossible to recognize the disease in the earlier stages in any other way, while the tuberculin test can determine whether an animal is affected even in the very beginning stages, even if there is no larger amount of tuberculous tissue in the animal than would equal a pea in size, the tuberculin test will recognize that as accurately and thoroughly as if the animal were in the last stages of the disease. On this basis it becomes possible to separate our herds, putting in one class all those animals that are absolutely free from any taint of the disease, and in the other class all those animals which are tainted in any possible degree by the presence of the diseased organism.

Wisconsin Statistics as to Tuberculosis.

The tuberculin test has been used for a period of about eight or nine years. In Wisconsin it has only been used in a limited way. I have with me a number of bulletins which have just been issued, and more will be sent to all of you who are on the mailing list of the Experiment Station.

I refer to Bulletin No. 84 of the Wisconsin Experiment Station, which may be had upon application by anyone desiring the same. In that bulletin you will read of the results of the tuberculin test made under the auspices of the Experiment Station and also by the State Veterinarian, for the last five years. We have incorporated here the results of something like four or five thousand tests.

This fact is brought out in a striking manner, that the amount of tuberculosis is found to vary very greatly, depending as to whether those herds have been suspected of containing disease or not. In all of those herds that had been examined, where the owners had reason to think that there had been tuberculosis in the herd before, we have found almost without exception that the disease has been more or less widely distributed. Out of 323 animals tested by the Experiment Station, 115 have been found to react, and out of 558 tested by the State Veterinarian, 198 were found to react; in other words, almost one-third of all the animals in those herds, in which there was reason to believe that the disease was present from a physical examina-
tion of the animals, one-third of these animals responded to the tuberculin test. Out of a considerably larger number of animals that have been tested for shipping purposes into Illinois, 3,500 of these animals, only 76 reacted, showing only about 2 per cent. affected. I believe this represents a very much more correct average percentage of the disease in our State than do those figures which have been taken from herds in which there was reason to suspect the presence of the disease, for in most cases the herds which have been brought to our attention have been those in which the disease was suspected to be present. Whether our State is in a worse condition than others is a question that we cannot answer at the present time. In all probability we only have a small amount of the disease, but it is very unequally distributed, as you will see in studying these bulletins.

A question of very considerable practical importance is: How does this disease find its way into our herds? Let us answer with this proposition which I presume is known to most of you; that this disease is produced by a living organism which is capable of growth just exactly as a plant is capable of growth when placed under favorable conditions, when this organism finds its way into an animal from some pre-existing case of the disease. It does not and never can originate in and of itself. The conditions which surround the animal may modify to a very considerable extent the rate at which the disease may go on, but it cannot produce the disease in the beginning; it must come from some other case of tuberculosis, either directly or indirectly.

How Herds Become Infected.

A question of very great importance is: How do our herds become infected, and we have reason to believe that it is very largely through the purchase of animals which are infected in the beginning stages, but not sufficiently far advanced so that it may be detected by an ordinary physical examination. In our records we have the record of one herd in the State of Wisconsin that has been the means of distributing the disease to sixteen other herds in Northwestern States. If you will apply the tuberculin test to those animals which you introduce in your herds, it is possible for you to prevent the introduction of the disease.

This disease is spreading more and more rapidly at the present time, a great deal more so than formerly, for the reason that there is more interchange of cattle. With the development of the dairy industry and these pure-bred races of stock there has been more and more sale and purchase of animals, which have come from these sources. If such breeding stock is infected, or tainted with tuberculosis, it is a menace, not only to the owner himself, but to every man who buys stock from him.

I have taken these statistics which have been collected at the Experiment Station, and have divided the different herds into three classes; first, those herds that are used exclusively for breeding; second, those that we might call milk supply herds, where they supply towns and cities with milk directly, and finally, those herds that we might call dairy herds, that are used for the manufacture of butter in creameries. Sixteen breeding herds have been tested, sixteen milk supply herds have been tested, and thirty-seven dairy herds. Out of 365 breeding animals 11 per cent. had tuberculosis; out of 296 milk supply animals 18 per cent. had tuberculosis; and out of 713 dairy animals 20 per cent. had tuberculosis. So far as this data shows the breeding herds of our State are not yet tainted with the disease to the extent that the milk supply or the dairy herds are, and in all probability this condition is due in part at least to the fact that the breeding animals are kept in better hygienic and sanitary conditions, better care is taken of them than with the dairy herds or with the milk supply herds; for it is a notorious fact that most filthy conditions surround the milk supplies of many towns, particularly large cities, and under these conditions, if one single tuberculous animal is introduced into a herd of that class, the disease is bound to spread very much more rapidly than if introduced into a herd in which the sanitary conditions are very much better.

There are other ways in which the disease may be introduced into our midst, and one of them is through in-
affected skim milk in the creameries. This is found to be true, especially in those sections of the country where tuberculosis is present to a very considerable extent. In Denmark three years ago over 40 per cent. of their herds responded to the tuberculin test, and you can easily see that the milk of those animals, taken to the creameries and then taken back to the farms in the form of skim milk, would carry with it the tuberculous organisms contained in that milk, so that not only one animal to another. There is the ground plan of a barn which housed about twenty or twenty-five animals, and one of those animals had the beginning stages of tuberculosis when she was brought into the herd. She was kept in that herd for two or three years before she began to be physically diseased, and then when it became evident the animal was affected with tuberculosis, the tuberculin test was applied to the whole herd with the result that every animal in the part calves, but swine, were becoming more and more affected in that country. This matter got to be so bad in Denmark that two years ago the legislature of that country passed very stringent laws, which now compel the heating of every drop of milk taken back from the creamery so as to insure the destruction of the tubercle organism if it happens to be present.

Manner of Spread in the Herd.

So much for the manner of introduction of the disease into our herds. Now, a few words in regard to the spread of the disease. How does a diseased organism find its way from the original infected animal to those about it? In this bulletin you will find a diagram which will give you, I trust, an object lesson showing the manner in which this disease is spread from of the barn in which this originally infected animal stood, had acquired the disease, whereas in the other part of the barn, which was separated by an ordinary board partition, only four animals out of twelve had acquired the disease. When we bear in mind that they were watered from a common watering trough, that these animals all had contact one with another, it is not at all surprising that these four animals acquired the disease. In other words, it is a question of contact. The disease is propagated in your herd exactly in the same way that it is propagated in human beings. The reason we find tuberculosis running in human families is simply because carelessness is exercised in regard to the disposition of the expectorations from the tuberculous patient. Even where precautions are taken, if there is an op-
portunity for these germs to pass from an individual out into the air, where they may readily dry, they can easily be breathed into the lungs in the form of dried particles of dust, and so where you have a tuberculous person in the house, it becomes necessary to use great care in regard to the disposition of the sputa from that person.

This proposition is also true for animals. Some may say that cows do not expectorate, and while it is true that they do not in the way that human beings do, still there are emanations from the animal, saliva drools from the mouth, and the very act of coughing forces out fine particles of mucus from the lungs in exactly the same manner as from the human being. The danger of this material has been proved by putting a nose bag over the cow and examining the exhalations and it was found that it contained germs of this disease. If this disease was rapid in its growth, like hog cholera or anthrax, for instance, it would in a sense be easier to control, but the fact that this disease is so slow in its development makes it possible that there may be months of it before the animal will show any physical symptoms and then it becomes very, very difficult to control. The only way that it is possible to control it is to determine its presence by means of the tuberculin test, and then separate absolutely and entirely all animals that react to the test from all those that do not react. When you thus separate the "sheep from the goats," you will be surprised very frequently to find that some of the best-conditioned animals have responded to the test. You will find an illustration of this sort in this bulletin. See Figs. 3 and 4.

Treatment for Tuberculous Cattle.

The only way you can handle this disease is, first, to apply the tuberculin test, and then separate and isolate your animals. Then the question comes up, what shall we do with those animals which do react to the tuberculin test? There is a great deal of opposition to all discussion of this matter, for the reason that some people have conceived the notion that it becomes absolutely necessary to destroy immediately and entirely all animals that respond to the test regardless of their condition as to whether they have the disease in the early stages, or in the advanced stages.

Before I go into a discussion of this point, I want to present some data that have been determined to be actual facts, not theories, in regard to raising healthy calves from animals which respond to the tuberculin test. It has been found not only in our own experience, but in the experience of other investigators, that it is possible to take an animal that responds to the tuberculin test and use it for breeding purposes, and, if the calf from that animal is taken from the dam immediately after birth, and is fed upon the milk of animals that do not respond to the test, or upon boiled milk, it is further possible to raise that calf in a perfectly healthy condition. In exactly the same way that a child may be raised when taken from a tuberculous mother and placed in some other family in which there are no symptoms of the disease. Generally such a child grows up and dies from some other disease than tuberculosis. In other words, such a thing as hereditary transmission of tuberculosis, under ordinary conditions, does not occur, either among human beings or animals, except in very rare cases. There are probably not over twenty cases on record in the world where human beings have been found at birth to be tuberculous, but I might say that ninety-nine and ninety-nine hundredths percent of all animals born from tuberculous cows, if separated immediately after birth, or within a day or so, and fed upon milk which is known not to contain the seeds of this disease, can be raised under perfectly healthy conditions. A knowledge of this fact gives us the means of coping with this disease.

In some States it has been the custom to slaughter all animals that responded to the tuberculin test, regardless of their conditions, and when a man's herd was slaughtered, and it was found perhaps that only one little gland in the animal was affected with the disease, naturally he rebelled against any State supervision which would result in the destruction of his property, and, while it is true that a great many animals have been slaugh-
tered, it is not true that those animals may not have gone on and if left to themselves might not have developed the disease in a severe form. We killed an animal two weeks ago in an extreme stage of the disease, an animal that had been known to have been

Fig. 3.—An apparently healthy-looking pure-bred bull diagnosed as tubercular on the basis of the tuberculin test.

tuberculous for five years, and every year that animal had dropped a calf which had been tested with tuberculin and found to be perfectly healthy. In no case have the calves from that animal ever acquired tuberculosis, although in some instances they have been kept for a period of two or three years. So you see where animals are valuable enough, it is possible for us to quarantine, separate those animals

Fig. 4.—Same animal as in Fig. 3, eighteen months later, in the last stages of "quick consumption."

by themselves, and keep them for breeding purposes. It is necessary to treat the milk from animals, for the milk of such animals is at times the means of disseminating the disease.
DISCUSSION.

A Member—Is it true that the milk of a tuberculous cow can disseminate the disease unless the tuberculosis is located in the udder?

Prof. Russell—Yes; where the disease is spread through the system without appearing particularly in the udder, the milk of the animal is generally affected, that is, where it is in the lungs, liver and spleen, without the udder itself being apparently affected. In comparatively few, indeed, a very small percentage of the animals that respond, does one find that the milk is affected, but as there is, of course, a possibility of those animals giving tuberculous milk at some subsequent time, if they are kept under conditions where the disease will go on and grow in their system, the milk should not be fed unless treated.

Prof. Henry—Suppose the animal is apparently in perfect health and fine flesh, is there any danger from the milk if there is no disease in the udder?

Prof. Russell—You can’t tell in regard to that. My rule in regard to the milk of all reacting animals is to treat it as if it were tuberculous, then you are entirely on the safe side. That can be done simply by the application of heat. If the milk is heated in a closed vessel to a temperature of 140 degrees Fahrenheit, for a period of fifteen minutes, or in the ordinary open vessel to 160 or 175 degrees, for ten or fifteen minutes, if there are any tubercular germs in that milk they will be destroyed by that process, and it is possible by heating milk at 140 degrees to destroy the tubercle organisms without altering in any essential way the character of the milk. Even the creaming power of the milk is not interfered with upon the application of heat under these conditions.

Mr. Wallace—When these animals are taken to the slaughter house, what do you propose to do with them eventually?

Prof. Russell—Those animals are perfectly safe for ordinary purposes, to kill for beef. They are killed subject to inspection, of course.

Mr. Wallace—How would it be for the breeders of cattle in any given State to come to an agreement that they would test, not by State inspection, but by some good inspector, because State inspectors are willing to make private examinations and say nothing about it, at least they are in Iowa—that they would agree that they should be all actually inspected, that they would separate them, and that they would sell nothing except when subjected to the tuberculin test, what do you think of that way of getting at the subject in a practical way?

Prof. Russell—I think it would be perfectly feasible.

Mr. Wallace—And if four or five of the leading breeders in each State would do that, every one would have to.

Prof. Russell—The breeders of the State of Wisconsin never will use the tuberculin test, as a class, until the purchasers of animals want that test. When they go to a breeder and say, “I want a cow or a bull, but I want it tested,” then the breeders will have to face this question. There are breeders in this State who don’t want to consider this question at all, and I am glad to say there are other breeders that hail with delight any fair-minded discussion of this subject, for they know the condition of their own herds, they know their own herds are entirely free from disease, and they of course recognize that if a general discussion of this subject is brought out, that it is to their advantage.

Mr. Wallace—At the Station have you ever undertaken to determine whether an animal in apparently perfect health, that is, having the disease in its incipient stage, will actually give tuberculous milk?

Prof. Russell—We killed an animal last week that was apparently in perfect health; it looked as well as any animal we ever had, and when that carcass was opened a condition of affairs was revealed that would shock people here, if they saw it. It is impossible for any man, even an experienced veterinarian, to tell what the condition of the inside of an animal is before slaughter. Under those conditions I say it is wise to treat the milk of all reacting animals as if it were diseased, recognizing the fact that it may not be in a majority of instances. It has been determined that in a very considerable number of cases the milk of such animals as you refer to did possess infectious principles.
Mr. Wallace—One more question. Is it not a great deal more reasonable to expect the breeders, with their supposed higher intelligence, to undertake this reform, than it is to go on until we develop a public opinion that will damage the industry in all lines? Isn’t it the best thing to commence with the breeders and get them to wake up to this point?

Prof. Russell—I don’t see where a fair, open discussion of this question is going to damage anyone. The tuberculosis question can be treated in a way that is fair and right, but there are agricultural papers which take a stand that I believe is quite unjustifiable. They cry down all discussion of this subject, and say that the tuberculin test is no good whatever. What that is done for I can’t say.

Mr. Wallace—The position taken by many is that all animals ought to be killed. Now, that, of course, would ruin the breeding business, and that is the reason breeders object; that interferes so seriously with the breeding business that breeders bring all their force to bear upon editors to keep them talking on the other side.

Prof. Russell—The middle-of-the-road policy is perhaps a wise one to follow in this, as in politics or religion.

A Member—Is the tuberculin test infallible?

Prof. Russell—No, I don’t say it is, but I do say that the mistakes which have been attributed to the tuberculin test are more frequently due to the fault of the manipulator than to the test itself. In my experience I have killed only two animals that responded to the tuberculin test in which I was unable to find the disease present upon post mortem examinations.

Mr. Wallace—Suppose a case down in Illinois, where a herd was tested, where the animals had been run around the yard and worked up and excited. Wouldn’t that naturally cause a reaction?

Prof. Russell—It would cause a rise of temperature. I do not say that there are not men undertaking to make the test who do not know how to do it, although it does not require a great deal of skill or knowledge to know that when you drive animals around in a hurry and get them heated up, that you will nullify the action of the test. That is one of the greatest difficulties in the use of the test, that the normal temperature of the cow is subject to fluctuations of one or two degrees, or even more, so that it is necessary to take a number of temperatures before the test is made in order to establish the normal from which to work. But, of course, no trouble of that character should be charged against the use of the tuberculin test. It is because it is operated by somebody who either does not know his business or perhaps does it to discredit the test.

Supt. Mc Kerrow—Have they found anywhere that they have gotten a safeguard on people who don’t know their business?

Prof. Russell—No; in many cases one’s judgment must be taken into consideration, but this test is a great deal more accurate than any method that is based upon the physical examination that has hitherto been used.

Supt. Mc Kerrow—Right along that line I have been informed that the State of Pennsylvania has the nearest to a system that seems to be a satisfactory solution of the method of handling this question.

Prof. Russell—It follows practically the line which I have given. They give an option to the man after the test has been made, and the test is only made upon his asking for it. There they find the people are anxious to determine the actual condition of their herds. When the test is made, the owner either quarantines those reacting animals (and they are allowed to utilize the product under certain conditions) or else slaughters them. The owner can take either horn of the dilemma. You must bear in mind that this question is one which will cost you either money or time. If you have tuberculosis in your herds, it is a bad condition of affairs the best you can do, and the question is, how are you going to get out of it with the least possible loss, either in money or time. If you have only one or two animals the quickest thing is to destroy them, disinfect your barn and see that you do not introduce any more animals which have the disease. On the other hand, if you have thirty or forty, the other plan is open to you.

Supt. Mc Kerrow—Every once in a
while a farmer asks me how he can tell the condition of his animals in this respect without going to the expense of having a veterinarian to test them.

Prof. Russell—The only way that you can tell with any degree of accuracy is to employ the tuberculin test. I would not advise the farmer who has not had experience to attempt to do it himself. The students in the Agricultural College are doing this, and sometimes neighbors help each other rather than to hire a veterinarian.

Supt. McKerrow—There is no way by which you can stand and look at an animal and tell whether it is tuberculous or not?

Prof. Russell—None that I know of.

Supt. McKerrow—What is this test? Explain it a little, please.

Prof. Russell—The test is simply taking the temperature several times before the introduction of this tuberculin and then taking the temperature several times afterwards. In the case of an animal that is affected with tuberculosis, even in the very beginning stages, the temperature will begin to go up about six or eight hours after, and will continue to rise until it is two, three, four, five, and sometimes as high as six degrees above normal temperature. You see it is simply a question of correctness in reading the thermometer, which registers the temperature of the animal before and after the introduction of the tuberculin.

A Member—How is it applied to the animal?

Prof. Russell—By means of a hypodermic syringe, exactly the same as a hypodermic injection of morphine into the human. It is introduced generally in the neighborhood of the shoulder, but it can be any part of the body.

Mr. Scott—Have any experiments been carried on in any State to determine the effect of sound and thorough ventilation in our stables as tending to prevent the contraction and development of the disease?

Prof. Russell—Yes, the State of Pennsylvania has carried on extensive experiments on that line. They have a complete barn, an old-fashioned Dutch barn, with a hay loft above, just about high enough for a man to stand in, with little narrow windows, representing the average Pennsylvania barn. Right opposite that, they have built a hygienic barn, with lots of sunshine, put in good wooden stanchions on cement floors, and that barn is kept in the very best condition. Animals were taken which had responded to the tuberculin test and placed next to healthy animals, alternating first an affected, next a healthy cow. At intervals of every two weeks they were transferred from one barn to the other, so that each healthy animal in the two barns was brought in contact with the same tuberculous animal under practically the same conditions, and it was found that the animals which were housed in the well ventilated, well lighted barn, in no case contracted the disease—it was either none or only one case, whereas in the case of the old-fashioned, dark barn, ill ventilated, every animal that was healthy when it went in and was in contact with these tuberculous animals, acquired the disease.

Mr. Scott—How long were they there?

Prof. Russell—I think about a year.

Mr. Wallace—In the light of that fact, what sense is there in Legislatures passing laws allowing the Governor to quarantine the State against cattle coming within its borders as long as they have their own stables built rotten with filth?

Prof. Russell—You have got to educate public opinion; in all legislation you must have a basis of public opinion for it. We shall never have a condition of affairs which will warrant any kind of legislation unless we have people understanding the nature of this disease, how it is produced and disseminated. Now where States do try to weed out this thing, it is imperative that they should do something to prevent some other State from using them as a dumping ground.

Mr. Wallace—Do I look very consumptive, Professor?

Prof. Russell—I have not applied the tuberculin test to you yet.

Mr. Wallace—But from outward examination you would not think I was very consumptive. I came from one of the most tuberculous families that ever existed. I have lost four brothers and three sisters, my mother, and perhaps twenty cousins from consumption.
Prof. Russell—That simply is an example of the proposition that heredity does not transfer the disease. It is simply contact with the organism that produces the disease, not any hereditary taint.

Mr. Scott—Were you raised on sterilized milk?

Mr. Wallace—When I was raised we didn’t know anything about sterilization, I was away from home; I left home before the disease started in the family.

Mr. Sweet—A question arises in the minds of many farmers which I wish you would answer. Are you satisfied that the introduction of the lymph into an otherwise healthy animal has no effect upon the animal?

Prof. Russell—Yes, I am. I have used the tuberculin in perfectly healthy animals for years without the slightest symptom of any trouble whatever. It is the universal experience of all those States that have paid any attention to the question that the introduction of tuberculin into healthy animals does not affect their health in any way, nor the milk producing faculty.

Mr. Sweet—Do they ever use this test on human subjects?

Prof. Russell—Yes, it is used in tuberculosis sanitariums.

Mr. Sweet—Have you any data to show whether this disease is more prevalent in high or low altitudes?

Prof. Russell—It is peculiarly a disease of the temperate zone. One reason why that is so is that people in the tropics live out of doors more, where the liability of contracting the disease is much less. It is those people who live in confined quarters, in ill-ventilated rooms, who have much more tuberculosis than the farmer or the man who lives out of doors.

Question—Is the temperature of healthy animals the same as that of human beings?

Prof. Russell—No, the temperature is higher, two or three degrees, than that of human beings; it runs from 101 to 102.

The Chairman—Our next subject will be that of Growing Beef, and will be given to us by Stanley R. Pierce, of Creston, Ill. This young man raised beef that sold for $1.50 a pound at the Chicago Fat Stock Show last fall. A good many years ago I met a boy at some of the Western fairs. I sized him up and I said to myself that this young man had an object in life, and that object was to grow the best cattle that could be grown. When Mr. Pierce won that prize through his wonderful steer "Advance," last fall, at Chicago, I was a little proud that I had seen so far ahead. It was hard work to get Mr. Pierce here, and he is very anxious to get back to his "daddies," so I will not take time talking about him. I know you are all anxious to hear how "Advance" was raised.