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COMMITTEE ON AGRICULTURE AND
COLONIZATION, 1925.

ADDRESSES.

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AGRICULTURE AND COLONIZATION
HOUSE OF COMMONS

Addresses

DELIVERED BEFORE THE COMMITTEE

BY

DR. GEORGE HILTON, V.S., Veterinary Director General

DR. E. A. WATSON, B.S., Chief Animal Pathologist

L. H. NEWMAN, B.S.A., Dominion Cerealist

March 5 and 26, 1925



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	PAGES
DR. HILTON'S ADDRESS - - - -	1-14
DR. WATSON'S ADDRESS - - - -	15-24
MR. NEWMAN'S ADDRESS - - - -	25-37



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SELECT STANDING COMMITTEE ON AGRICULTURE AND COLONIZATION

ADDRESSES

HOUSE OF COMMONS,

March 5, 1925.

The Committee met at 11 o'clock a.m., Mr. W. F. Kay, the Chairman, presiding.

The CHAIRMAN: Gentlemen, we have with us this morning Dr. Hilton and Dr. Watson who will address us on the work being done in regard to bovine tuberculosis. I will ask Dr. Hilton to address the Committee.

Dr. GEORGE HILTON: Mr. Chairman and gentlemen, the question of the control of bovine tuberculosis, as you know, has always given the authorities in all countries a great deal of concern, because they realized many years ago that this disease caused a serious economic loss and that it was also a great menace to human life. The great difficulty has been due to the prevalence of this disease and also to the high cost involved in its control.

Many years ago, in fact in 1896, the late Dr. McEachran, in his report to his Minister at that time, strongly recommended that Parliament should be asked to provide a sum of \$100,000 for the purpose of eradicating this disease in Canada. Although the recommendation was supported by facts showing that the disease was very limited in Canadian herds at that time, and that it could be eradicated at a reasonable cost, public opinion was not in favour of it, and the first compensation policy was not adopted in this country until 1914, or nearly eighteen years later. Soon after the discovery of tuberculin, practically thirty-five years ago, the Government of this country thought it advisable to ascertain the extent of infection in our herds, and in order to encourage testing they obtained tuberculin and supplied it to veterinary practitioners under certain definite conditions. Later, the Government decided to make its own tuberculin, and did so in its own laboratories, still supplying it to veterinary practitioners. Still later, owing to increased interest in testing, it was decided to identify reacting cattle, that is, cattle that reacted to official tuberculin; these cattle were permanently ear marked by punching the letter T through the right ear, and their exportation was then prohibited.

No further progress was made for some years, or until 1905. The department then adopted its first policy known as the supervised herd plan. This was not a compulsory policy; it was available to anyone who desired to take advantage of it. The department, in accepting these herds, takes all possible steps to eradicate tuberculosis in the herds and to maintain these herds free from it. The cattle are tested free of charge and every assistance is given the owner. This policy is still in force. At the present time there are only 107 herds under this plan. These herds contain about 1,500 head of cattle and no compensation is paid under this policy, but reactors must be slaughtered under our supervision.

A little later the press began to agitate for increased action in the control of tuberculosis, and in 1914 the department passed the municipal tuberculosis order. This order was adopted for the purpose of assisting municipalities who desired to provide a safe milk supply for their people. Compensation was paid under this order, which required that all cattle supplying milk in a municipality should pass the tuberculin test. It was not long before municipalities experienced difficulty in passing by-laws to comply with the provisions of this order. This difficulty was due to the fact that a large number of dairymen objected to having their cattle tested and slaughtered, and as a result, it was necessary to amend this order three years later, in 1917. The amended order required that only cattle should be tested from which milk was sold in the raw state. The dairies in these municipalities were therefore divided into two classes, the raw milk dairies, and the pasteurized milk dairies. This order was in force for nine years, but as under its provisions infected herds could be maintained in districts with clean herds, satisfactory progress could not be made in the control of the disease. It was costing too much money, and the department therefore decided about two years ago not to accept any more municipalities under this order. During the nine-year period that this order was in force, thirty-two municipalities took advantage of it. The majority of them were located in the provinces of Saskatchewan, Manitoba and Ontario. No further advances were made to control this disease until about eight or nine years ago. At that time, the American stock breeders were anxious to obtain assistance to help them clean up their herds, and they commenced an agitation in the United States. As the result of that agitation, conferences were held in the city of Chicago at which representatives were present from the various live stock associations, live stock sanitary associations, state officials, and federal officials from the United States and this country. These conferences were held for the sole purpose of selecting a suitable and workable plan to eradicate this disease in pure-bred herds. As a result of these conferences the accredited herd plan was chosen as a suitable and workable plan. It was decided that this plan should be applicable to this continent, and almost immediately the American authorities put it into operation. Canada waited for two years, and as it was found that progress was being made under this plan in the United States and that it was becoming popular, it was decided to adopt it. In 1919 the accredited herd regulations were therefore passed.

The object of this plan is to provide tuberculosis-free herds among our pure-bred breeding herds. When it was first put into operation, difficulty was experienced, because we were receiving a large number of applications from owners of herds which contained only one or two pure-bred animals, and they were not strictly speaking breeding herds. The department, therefore, decided that it was necessary to require that there must be a definite number of registered cattle in a herd to make it eligible for acceptance, and it was at first decided that there must be at least twelve. This decision, however, caused a great deal of dissatisfaction on the part of the smaller breeders, and it was finally decided to reduce the number to five, one of which must be a herd sire, and further that the registered animals must constitute 10 per cent of the herd. When this decision was reached, the applications became more numerous, and the department has had a great deal of difficulty in dealing with them. There is no doubt that by reducing the number of registered cattle, it has been possible for a much larger number of stockowners to take advantage of this plan, than would have otherwise been possible. The department felt it was justified in view of this fact in accepting herds with only a few registered cattle in them. Under this plan, the reactors are removed and compensation paid, unless the owner has a lot of valuable reactors and desirous to establish a Bang Herd. In such an event he is permitted to do so provided he has satisfactory quarters in which to keep that herd and there is no danger of contaminating his healthy herd. The maximum amount of compensation paid for reactors is \$100 for registered cattle, and \$40 for grades.

Under this plan every possible effort is made to clean up the herd and keep it clean. As soon as the herd has passed two clean annual tests, or three clean semi-annual tests, the department issues an accredited certificate, certifying that the herd is free from tuberculosis. Cattle from these accredited herds are then permitted to be shipped to the United States or from the United States to Canada without a special test. In other words, the American authorities recognize our accredited cattle, and we recognize the American accredited cattle.

Quite recently, with a view to reducing the amount of money paid out in compensation, it was decided that the department would not pay compensation for steers, scrub bulls and lumpy jaw cattle. There have been so many applications for accreditation of herds that we have had to refuse to accept them, owing to the fact that we have already accepted all the herds we can possibly handle with our present appropriation. We have at the present time in this country over 1,400 fully accredited herds. The majority of these herds are located in Ontario and Quebec. We have also over 2,000 herds that are undergoing accreditation, and about 200 herds that we have accepted, but have not been able to test.

This work in the United States has reached very large proportions. Every state in the Union is co-operating with the Federal authorities, both financially and in the field. The combined total appropriation in the United States for this work last year was \$6,000,000, and they are extending this work to restricted areas. They are cleaning up bovine tuberculosis on a large scale; at the present time they have over 35 modified areas, that is, areas in which tuberculosis has been reduced to one-half of one per cent. Cattle from these areas can be shipped into any state and all over the country without a special test.

Owing to the popularity of the accredited herd plan and of the increased demand for tuberculosis free cattle, the department considered that it might go a little bit further, and in 1922 it passed the restricted area regulations. The object of these regulations is to clean up tuberculosis in definite areas. The first area accepted was in Manitoba in the Carman district. That was nearly two years ago, just after the order was passed. There were approximately 16,400 cattle in that area at first test, and 5.58 per cent reacted. The reactors were removed and nearly all of them were shipped to Winnipeg and slaughtered under our inspection. On the second test, although over 900 reactors had been removed, there were nearly 200 more cattle in the area. This test was conducted about seven months after the first one, and the percentage of reactors was reduced to .5. The last, or third test in that area, was just completed last fall, and the percentage was reduced to .3.

We have just completed the first test under these regulations in an area in Quebec. This area comprises the counties of Beauharnois, Chateauguay and Huntingdon. We have not the complete figures, but we shall have tested more than 50,000 head of cattle in that area, and our percentage will not be much over eight per cent. In addition, we have retested approximately 5,000 cattle in that area that were on infected premises and we have found not more than .8 per cent react. This shows very plainly that we are able to pick out the large majority of infected animals at first test.

This work has shown most conclusively that tuberculosis can be eradicated provided the owner is interested, and is prepared and willing to do the things that are necessary to clean up his herd and to protect his animals; and that it can be done at a reasonable cost. The department adopted these policies because of the demand for tuberculosis-free cattle, and also because it realized that if it did not take action it could not develop our foreign markets. It is I think a safe assumption that if we do not have an adequate supply of tuberculosis-free cattle, we cannot expect to maintain our foreign markets, and this trade will only develop in the future, in proportion to the confidence the foreign buyers have in the health of our live stock.

Mr. HATFIELD: Dr. Hilton, could you give us any figures on the cost of the area in Manitoba? What did it cost to clean it up?

The WITNESS: I can give you the compensation cost. The total amount of compensation for the first test in the area was approximately \$32,800, and it has not cost \$9,000 for all subsequent tests. That is, in compensation.

By Mr. Caldwell:

Q. The compensation was higher than it is now?—A. Yes.

Q. It was cut down two years ago?—A. Yes. The maximum compensation now is \$100 for pure-breds and \$40 for grades.

By Mr. Hatfield:

Q. What about that in Quebec?—A. We have not got the complete figures, but it will cost nearly \$150,000.

By Mr. Caldwell:

Q. So the cost at the present time, for the same amount of work, will be much less by way of compensation?—A. Yes, it will be reduced accordingly.

By Mr. Lucas:

Q. What will be the beef value of the animals destroyed?—A. I have not those figures; I cannot say.

Q. They were not a total loss?—A. Oh, no.

Q. The owner would get the value of these cattle?—A. The owner would get the salvage he receives for the carcasses, in addition to the compensation awarded.

By Mr. Caldwell:

Q. They are not all considered fit for beef?—A. Some are, while others sell as canners, and some are a total loss.

By Dr. Grisdale:

Q. Some of them are?—A. Yes, a certain percentage. The reactors are destroyed under the supervision of the Meat Inspection Division, and if the beef is condemned the whole carcass goes into the fertilizing tank, and there is no salvage from that carcass.

By Mr. Leader:

Q. Can you give us the percentage showing the lesions in the area tested at Carman, and also the percentage condemned as totally unfit for food?—A. I have not got those figures.

Q. I think it is important we should know whether the test is correct—what percentage of infallibility there is in regard to these tests?—A. Yes, I think so, our records show approximately 14 per cent of all reactors do not show visible lesions upon slaughter, but this does not prove that they are not infected.

Q. Some are showing lesions and some are not?—A. Our figures show there are approximately 14 per cent of reacting cattle slaughtered, in which the officers of the Meat Inspection Department are not able to detect lesions. As far as the no-lesion cases are concerned, a special investigation has been made in the United States of these cases. They obtained specimens from these carcasses and sent them to their laboratories and made an examination of them microscopically, and also inoculated guinea pigs at the same time. They were able to prove that 25 per cent of these no-lesion cases were actually infected cases. When you consider the size of the carcass of an animal and the fact that the inspector cannot see anything wrong with it, he has no selective preference, and can only send some small glands. It is a very difficult matter to find the very small organism in the whole carcass of a cow.

Q. There is no reasonable doubt that if a beast reacts to a tuberculin test it is diseased?—A. As far as infection, yes, but whether an infected case has progressed sufficiently to produce disease is another matter. They are undoubtedly infected.

Q. They would be spreaders, would they not?—A. Sooner or later, at least in a number of cases.

By Mr. Lovie:

Q. There is no reasonable doubt, I don't think?—A. No.

Mr. LOVIE: Mr. J. I. Moffatt, a breeder of cattle in Manitoba, gave me the other day, when I was talking to him, his experience, as he had been through it. I would like to explain that to the Committee. He sent for slaughter a herd of thirty-nine, and went down to Winnipeg with them. I asked him afterwards if he was satisfied with what he had seen in Winnipeg, because he watched the whole bunch of them killed, and he said he was perfectly satisfied. He said there was a fine heifer for which he had paid a good price and from which he expected to breed, and he was greatly disappointed when she reacted and he said that from what he could see he would subject his herd to the test every time, to be absolutely sure that nothing would react, because he was sure there would be no reaction unless they had some sign of tuberculosis. He said he did not want to keep them unless they were clean. He was quite satisfied with what he saw.

By Mr. Hatfield:

Q. The statement has been made by the medical profession that bovine tuberculosis was a severe menace to human health. Is that true? It was said that medical men were almost unanimous in the belief that that was a fact?—A. The matter was settled by the British Royal Commission some years ago when they made a special investigation of it. The Commission was appointed and they worked on the problem for, I think, twelve months, and they finally reported that it was established beyond doubt that bovine tuberculosis was a menace to human health.

I think I have a little statement here from Krumwiede, in regard to that matter. This is from Cornell University and was taken from the minutes of the World's Dairy Congress in 1923. It says:—

“The extent to which tuberculosis of cattle affects public health has been for many years a subject of controversy. Results of numerous researches have shown that adult human beings are rarely, if ever affected with the bovine type of tubercle bacteria, but that children are susceptible. Park and Krumwiede found 26 per cent of the fatalities from tuberculosis in children from 5 to 16 years of age and 18 per cent in children under 5 years of age to be due to the bovine type of tubercle bacilli. Krumwiede has reported 101 cases of tuberculous meningitis of which 6 were caused by tubercle bacilli of the bovine type. In 36 cases of tuberculosis of the cervical glands he found 30 were due to the human and but 6 to the bovine kind (type). Doctor Park tells me that a recent examination of tuberculous glands from 50 children in New York Hospitals showed 42 of them to be due to the human and 8 to the bovine type of tubercle bacilli. The striking part of this statement was that all of the children infected with the bovine type came from the country. This points to the necessity of obtaining milk from sound cattle for the children in the rural districts where pasteurization is not practicable and to the efficiency of pasteurization in protecting the city consumers. Further evidence that human infection of bovine origin is not extensive is shown by the fact that during the last ten years, tuberculosis in cattle has been spreading, while the number of cases of tuberculosis in man has declined.”

That is from the American side, but the question has been definitely settled, by authorities in other countries.

By Mr. Caldwell:

Q. You spoke of the Bang herd. I do not know whether or not all the members present know what that means. It means cattle which have reacted and are kept for breeding purposes. It is a fact that calves from cows which react, if they are taken away from the dam when they are dropped, are often found to be free from tuberculosis.

Mr. HATFIELD: That is transmitted by the milk to the offspring?

Mr. CALDWELL: The inference would be it would be transmitted to the human. The point I wanted to make is that the theory of heredity in tuberculosis has been more or less exploded by the fact that they are able to raise calves free from tuberculosis from cows, if they are not allowed to have their milk.

The WITNESS: Yes, the object of the Bang system is to raise healthy calves from tuberculous dams.

By Mr. Caldwell:

Q. And is that possible?—A. Yes, it is possible but it requires a great deal of care.

Q. Is it worth while?—A. All I can say to that is this: that about 25 breeders took advantage of the Bang system under the Accredited Herd Plan, and only six of them are maintaining a Bang herd at the present time. They are gradually dropping out. I do not know why.

Q. Could you tell what the result of the breeding has been? Has a large percentage of the calves been free from tuberculosis from these Bang herds?—A. Yes, they have, and they have been added to tuberculosis-free herds. Directly a calf is dropped, it is taken away, sponged over with a disinfectant, and removed to another building, where it is kept isolated for three months, and if it then passes a clean test, it is taken into the premises on which the healthy herd is located. It is isolated there for a six-month period and then tested. If healthy it is added to the herd. These calves are fed milk from healthy cattle, or upon pasteurized milk.

By Mr. Brown:

Q. It is expected that the other will fall into the background by this method?—A. Yes. The man with a healthy herd does not want to be bothered with a diseased herd as soon as he gets the offspring from them.

By Mr. Caldwell:

Q. What does he do with the milk?—A. It is pasteurized and sold, I presume.

Q. It is all right if pasteurized?—A. Yes.

By Mr. Lovie:

Q. Mr. McGregor definitely stated he was going to get rid of his Bang herd as soon as he could, because he had come to the conclusion from actual experience that it was not worth while bothering with them?—A. Yes.

By Mr. Forrester:

Q. Do you find the calves from the Bang herd are more susceptible to disease if they come in contact with it later on?—A. I cannot say. All cattle are susceptible to tuberculosis.

Q. You do not think there would be any weakness in that regard?—A. There might be a higher susceptibility, yes, but there is one thing we have to

bear in mind and that is that bovine tuberculosis is essentially a contact disease, and the infection gets into the animals' bodies by ingestion. An animal becomes infected by either coming in contact with a tuberculous animal or by consuming fodders which have been contaminated by discharges from tuberculous animals. It is a matter of contact; nothing but contact. We have found some owners of accredited cattle in showing their cattle very careless. Many of our Fairs provide separate buildings for tuberculosis-free herds, but we have found the owners storing their bales of hay and bags of feed in the alleyways. Thousands of people pass through these alleyways; they have been in the buildings where untested cattle are kept, and they may contaminate the fodder, and infection results. We have records of animals from fully accredited herds reacting at the next test following the fair circuit, and it is quite possible that is the way they have become infected. It is all a matter of contact.

By Mr. Lucas:

Q. Are they using this accredited herd system in Great Britain and Europe??—A. No. They are in a different position to this continent. They have from 40 to 60 per cent infected cattle, whereas we have not more than 10 or 15 per cent.

Q. What percentage of the human race is affected by bovine tuberculosis, compared between Canada and the United States?—A. I cannot give you those figures.

By Mr. Warner:

Q. Could you say what percentage of cattle are what they call "spreaders"—who spread the disease?—A. No, I cannot. That would be a very, very difficult question to answer. It would be a very difficult thing to ascertain because the organism gains entrance to the body by ingestion. There may be slight lesions in the lungs; cattle cough, but they don't spit; they swallow the discharge, and it passes through the body with the manure. Anything that is contaminated with that manure, or other secretions from the animal's body, may infect an animal. Such conditions would make them spreaders before you could possibly detect any physical symptoms of disease. There is always that possibility.

By Mr. Forrester:

Q. Does the germ die in a very short time?—A. It does, if exposed to sunlight.

Q. What is the lifetime of a germ?—A. It is very, very short if exposed to sunlight, but if it is coated with dry manure, or dry filth of any kind, it will live indefinitely.

Q. What is the life span of the tubercle bacillus?—A. If you expose it to sunlight it will be killed in a few minutes, but if covered up and concealed anywhere, it may live indefinitely. For instance, in the case of an infected stable; if there are some of these organisms lying in the dirt in crevices, and these crevices have not been scraped out, cleaned, and disinfected, you will find that herd breaking;—you will find reactors in that herd twelve months afterwards, although there has been no history of the herd being in contact with any untested or diseased cattle.

Q. What is the life span of bacilli?—A. It has not been determined.

By Mr. Sexsmith:

Q. Is it not true that it does not die until the body dies?—A. Tubercle bacilli can only multiply in the bodies of living animals.

Q. It never dies?—A. I think in some cases the resistance in a well nourished individual will overcome the bacilli, and destroy them. They may be destroyed by the body cells.

Q. It heals it over, but leaves it in the cavities, but do these germs ever die?—A. Oh, yes. I think, however, we should leave that to our pathologist; it is a little more in his line.

By Mr. Caldwell:

Q. Do you recommend plenty of sunlight in your stables?—A. Yes.

Q. What do you recommend for the floors?—A. Any impervious floor; cement is preferable, but so long as you have a tight fitting floor it does not matter.

Q. You think a cement floor is preferable to any other?—A. It is much easier to keep clean, and cleanliness is essential.

Q. I mean from a point of preventing a germination?—A. Yes, because you want to avoid the crevices in which the bacilli can be concealed. That is the whole trouble, you cannot thoroughly disinfect a stable, unless it can be cleaned sufficiently to expose all parts in which the germs may be.

Q. Take a stable with a wooden floor; it is almost impossible to clean that?—A. Yes; an old wooden floor is difficult to clean.

Q. Do you not think educational work should be carried on along that line?—A. Yes.

Q. So that proper stables and proper sunlight could be had. Do you not think money would be well spent in carrying on an educational campaign of that kind?—A. Yes; that is part of the duties of the officers engaged in this work. They advise stock raisers regarding the importance of providing plenty of sunlight in their stables, and also regarding sanitation.

By Mr. Leader:

Q. What you mentioned a few moments ago in regard to the possibility of infection from fairs is a very serious matter with me. You said that these cattle are supposed to be segregated in disinfected buildings, but that through the feed and water pails and so on there is danger of contamination. There is no doubt about that, and I think there is also danger in leading animals into a show ring, where they have to stand side by side with animals perhaps not tested. I had a valuable cow slaughtered after I had had no reactions on my farm for three or four years. This cow did not show any disease, but later it was found that she was infected. If she was, she got this disease from following the fair circuit. I think that this government, while they are paying out millions or at least hundred of thousands of dollars now, should take this forward step in insisting that where they grant money to any fair boards, they should not allow any cattle on the fair grounds unless they have been tested for tuberculosis. I think they should insist upon that. I know there are a great many breeders who will not agree with me, but I know that many of the fair associations now have adopted that plan on their own initiative, and it seems to me this government would be doing what is right in insisting that where money is given a fair association they should insist that every bovine animal on the grounds be subjected to the test, as far as tuberculosis is concerned. Before I sit down, I think the doctor said that this is an international plan, modelled after the United States. We know it is true that the United States takes in grade herds as well as pure bred herds; they come in under the accredited herd plan?—A. Yes.

Q. And the reason we do not do it in Canada is because we cannot get enough money to take care of them?—A. Yes.

Q. Then why is there a reduction in the appropriation in the Health of Animals Branch? Can we not get the money?—A. That is a matter of policy.

Q. The Government also is unable to carry on an aggressive campaign to modify this disease when we are reducing the appropriation; we are going backwards rather than forward. You know I am in support of the plan?—A. Yes.

By Mr. Morin:

Q. Is the disease more common to-day than it was ten years ago?—A. I can only give you the figures from our Meat Inspection Service. Of course, the Meat Inspection Service just deals with animals slaughtered at abattoirs for interprovincial or export trade; it does not cover the small abattoirs which sell the meat within their province, but these are the figures for cattle from 1910. The percentage of tuberculosis in 1910 was 2.96; 1911, 3.22; 1912, 3.73; 1913, 3.89; 1914, 3.56; 1915, 3.91; 1916, 3.88; 1917, 4.10; 1918, 4.06; 1919, 3.72; 1920, 3.37; 1921, 4.37; 1922, 5.26; 1923, 6.68. From 1910 it increased from 2.96 per cent to 6.68 per cent in 1923; that is in cattle. In hogs in 1910 the percentage was 8.90, and it increased until in 1923 it was 23.31 per cent.

By Mr. Leader:

Q. Where do the hogs get the infection?—A. That is a question which is now under dispute and investigation. A few years ago they thought hogs developed tuberculosis from the bovine source; they thought hogs got infected by following cattle in the feed lots, through rooting in the manure, but that question is now under dispute and investigation and authorities have not made a definite statement.

Q. You are not disputing the fact that hogs will develop tuberculosis from following tuberculosis cows and consuming the byproducts of such?—A. It has always been thought so.

By an Hon. Member:

Q. It is not a fact that the fatality of hogs is greatest in the dairy districts?—A. Yes, but the reason why they commenced to look further into this matter was that in the modified areas in the United States they did not find that the percentage of tuberculosis in hogs was reduced after they cleaned up the areas. That is why special investigation is being made to ascertain where the infection in hogs comes from.

By Mr. Leader:

Q. Is that not because they find their hens infected?—A. That is another source; that is possible.

By Mr. Milne:

Q. I would like to ask the Doctor if it is possible for these germs to lie dormant in the body for a period of years, and then develop.—A. Yes.

Q. It is possible?—A. Yes. You might have the organisms there and the resistance of the system so great that the organism could not develop and multiply, but if for some reason that resistance was diminished the organisms would multiply rapidly and disease result.

Q. Under these circumstances would the animal be a reactor?—A. Yes. You see, a reaction denotes infection, that is all; it does not denote the stage of the infection.

By Mr. Warner:

Q. Have you any idea as to how long the germ would stay in a barn without that barn being disinfected; how long cattle would be susceptible to it?—A. It would remain alive almost indefinitely, so long as the sunlight could not get at it.

By an Hon. Member:

Q. In estimating how many pure-bred animals there are in a herd, are only those registered counted?—A. Yes, they must be registered. We do not accept a herd unless the five animals are all registered.

By Mr. Lovie:

Q. Have there been any requests for accredited herds to be established lately?—A. Yes, quite a number.

By Mr. Warner:

Q. Do I understand there are no accredited grade herds?—A. No, we do not accept grade herds, because it has taken us all our time to handle the applications for pure-bred herds.

Q. I had an idea that in the dairy districts there were some accredited grade herds; that is why I asked that question.—A. No.

Mr. CALDWELL: That is only under the municipal system.

The WITNESS: In a restricted area all herds come in, grades and pure-breds.

By Mr. Warner:

Q. I guess that is where I was mixed up, because I thought there were accredited grade herds, but I understand there are not, except where they are in a restricted area.—A. Yes.

Doctor GRISDALE: There is the municipal testing, of course.

The WITNESS: Yes, under the Municipal Tuberculosis order, all herds are tested from which milk is sold in the municipality.

By Mr. Caldwell:

Q. And in a herd where there are five registered pure-breds you test the grades as well?—A. Yes all the herd, but we have another condition before accepting, that the pure-breds must constitute ten per cent of the herd. That is so, a man with 70 or 80 grade cattle and only five pure-breds would not be eligible.

By Mr. Lovie:

Q. How many applications have been made for restricted areas, and how many are under contemplation by the government?—A. I could not tell you how many are under contemplation, and I could not tell you the exact number of applications we have had, but there must have been a dozen at least.

Q. You have accepted two?—A. Yes, we have started on two, one in Quebec and one in Manitoba.

By Mr. Warner:

Q. Are you considering any more of these restricted areas to be established now?—A. It is a matter for the Minister to decide, as to whether any more areas shall be established.

By Mr. Hatfield:

Q. As a matter of fact, the Minister is on record as saying that he is not considering any more applications for restricted areas at the present time.—A. I could not say.

By Mr. Leader:

Q. I think the whole matter hinges on the lack of funds. I think the Federal Government should be assisted in this great work by our Provincial Governments and the municipalities, if necessary. That is in vogue in the United States; the Federal Government will not take up this work in any state unless the state will pay a proportionate amount in compensation for the slaughter of the animals, therefore they get co-operation with the State Governments, and they are all working together to make this a success. I think this Government should do the same, put it up to the provinces and say that they cannot get enough money to take care of this work; the work is becoming very popular,

and the Provincial Governments will get their eyes opened to the necessity of this work, and they will share the expense with the Federal Government.

By the Chairman:

Q. Doctor Hilton, is there that co-operation between the provinces?—A. There is, in the restricted area work; they co-operate in assisting in organizing the work and in arranging transportation for our officers from farm to farm, but not financially.

Q. Is there any duplication of work by the provinces or the Federal Government?—A. Yes, some of the provinces have been engaged in tuberculosis eradication work, Quebec has such a policy, and so has British Columbia.

Q. Would it not be better to have it done under one authority?—A. I think so.

Q. Any effort been made to do that?—A. No, not that I am aware of.

By Mr. Hatfield:

Q. In connection with your accredited herd system, you insist, if I understand it, that no cow from a farm or a herd which is not accredited can be served by a bull on an accredited farm. That is correct, is it not?—A. Yes.

Q. That, it seems to me, works considerable hardship to the owners of high grade cows in that vicinity, in the case of a man having an accredited herd who has a very valuable sire, where the use of that sire might be given to the owners of very high grade cows. It seems to me that some system might be worked out whereby they could use that sire. I am informed that there is a possibility of contagion by contact, but I am wondering if the experts in your department could not conceive some plan whereby the place of service could be properly constructed and overseen by your officials, in order that those cows could have that benefit, because that means a great deal to the community, if the general standard of the dairy cows could be raised by the use of that sire. I would just suggest that possibly you could work out some scheme whereby the use of that sire would be available to the owners of grade cows in that vicinity?—A. That question has received a great deal of consideration, and in fact it was permitted at first; it was permitted in the United States, provided that the breeding operations were performed on neutral ground. The United States found after a year and a half that they could not make progress that way at all, so they discontinued it, because they kept getting breaks in the herds. The whole trouble is that while it appears to be a nice scheme theoretically, and looks as though it could be satisfactorily arranged, it is not really practicable, and is often the means of disseminating infection.

By an Hon. Member:

Q. Just before you sit down, in reply to a question by Mr. Caldwell regarding compensation, you had been speaking about \$100 for pure-breds, and I think you said it was \$200 before 1922?—A. The Act providing for compensation was amended in 1912; the compensation is two-thirds of the value in each case, but in 1912 the maximum amount of valuation allowed by the Act for pure-breds was \$150, and \$60 for grades. It was amended in April, 1918, increasing the total maximum for pure-breds to \$250, and for grades to \$80. That was for one year. It was then extended for another year, then in 1912 it was reduced to \$200 for pure-breds and \$60 for grades, and on July 1, 1923, it was reduced to \$150 for pure-breds and \$60 for grades.

Q. I just wanted to make that clear, because I think it might have been misunderstood?—A. Yes. That is the actual value, two-thirds.

By an Hon. Member:

Q. What is it now?—A. One hundred dollars compensation, two-thirds of \$150.

By Mr. Brown:

Q. What are the regulations in regard to municipal testing, for instance in a district like Winnipeg, in regard to the owners of those dairies going out and buying cows and getting them tested? Must they be tested before they are brought in, or after?—A. They are tested in Winnipeg where they are purchased. In Winnipeg the majority of the cattle are purchased in the stockyards, the market is in the stockyards; and the animals are tested in the stockyards.

By Mr. Caldwell:

Q. You do not mean to say that every pure-bred animal is compensated at the rate of \$100, which is the maximum?—A. Yes.

Q. The maximum is set according to the quality of the animal from that amount down?—A. Yes.

Q. Can you give us what the average compensation would be?—A. The average compensation under the accredited herd plan has been \$38.75.

Q. For pure-bred?—A. All combined, pure-bred and grades, it is the average of the total paid.

Q. You do not have them separated?—A. No.

By Mr. Stewart:

Q. Is it possible to get \$100 now for compensation for what is called pure-bred?—A. Yes, if the person has an exceptionally good animal.

Q. I have read the new regulations issued this winter, and there is one paragraph which states that if these regulations are followed strictly the very most you could get for the cream of the herd would be \$92 or \$94?—A. Yes.

Q. Therefore, a man cannot get \$100 compensation for the very cream of his herd?—A. Well, the object of that was to get more uniformity.

Q. I am not finding fault with the object, that was all right.

Dr. HILTON: Under the past method of valuing animals, a man who had an expensive animal was the man who lost the greatest amount of money, he got the smallest compensation in proportion to value. The man who had an ordinary animal would get his \$40, whereas the man who had a high-producing grade dairy cow would get the same value for it; it was considered that we could make our money go further and test more cattle if we exercised more care in the method of grading the values of animals. The latest instructions to our officers are, that they must not give the maximum value for an animal unless that animal is an exceptionally valuable one. Take the pure-bred animal, take a herd where they have animals costing several thousand dollars, that man would get the maximum compensation for such reactors.

By Mr. Stewart:

Q. Am I not right in stating that there is a clause in the regulations whereby you can only get for the very cream of your herd \$93 or \$94?—A. Yes, but it also states that if you have a perfect animal you will get the maximum compensation.

By Mr. Caldwell:

Q. Have you found any perfect ones?—A. Yes, so far as compensation is concerned, we have.

By an hon. Member:

Q. In the same regulations there is a paragraph near the close which I think is intended to cover that point. It will be understood that a great many animals of superior quality go far beyond the value mentioned in these regulations, and I think that that paragraph is intended for those super-animals which run up from \$200 into the thousands. I do not think that there would be any question of these animals being allowed \$150 compensation?—A. No.

Witness retired.

The CHAIRMAN: I suggest that we hear now Dr. Watson.

Dr. E. A. WATSON, Chief Pathologist: Mr. Chairman and gentlemen, I had a very short time in which to prepare this address, and it was only an hour ago that I learned that the title of it was "Progress in Research Work in Tuberculosis in Canada." It would be more to the point possibly, if the title had been "the need for research work in tuberculosis in Canada."

I would like to explain first, so that my position may not be misunderstood or that any statements I may make may not be misunderstood, that as Pathologist and Research Officer, it is part of my duty to examine plans aiming to control or to eradicate disease and to study them with a critical mind, to seek out and to point out possible sources of danger, error, or failures, as well as to direct attention to advances in scientific knowledge. In doing so, I have to have frequent discussions with my chief, Dr. Hilton, and quite naturally we do not always agree on all the various points which have to be taken into consideration. I want to make that quite clear, so that no wrong interpretation be given to some of the remarks I may have to make which are not wholly in accord with popular ideas and measures commonly thought applicable and efficient in tuberculosis eradication work. A great many questions were asked Dr. Hilton, more or less of a pathological or bacteriological nature which, as I will point out later, cannot be definitely answered with our present knowledge nor until a great deal more research work has been done.

The tuberculosis problem is so complex and has so many phases and ramifications that it is practically impossible to discuss it in a general way; it must be looked at from certain aspects or from certain points of view and along special lines. The theme that I would choose for this occasion and the point I would emphasize all through my remarks is research, the great need and necessity for real research, not superficial research, but continuous, exhaustive and intensive research. We cannot go far into any phase of the tuberculosis problem without stepping into doubt and darkness. We have to admit a lack of scientific knowledge and fundamental knowledge that is not yet available, but which certainly can be ascertained by intensive research and study. It is true that a tremendous amount of work and investigation has been devoted to tuberculosis, more than to any other health problem, but the solution of it is still far away. As a result of the work that has been done we perhaps know better in regard to tuberculosis just where our knowledge stops and where it is essential to seek for it.

The truth is—and this is not only my own viewpoint, but the viewpoint of a number of eminent scientists and special committees studying the tuberculosis problem—attempts are being made to direct stupendous operations very far-reaching in their consequence and effect, far beyond our present vision, involving a tremendous sacrifice of animal life and a heavy burden of cost, all from a relatively slender base of scientific knowledge and fact.

Perhaps we have been forced to this to some extent on the American continent by a very impatient public clamouring for relief and practical results; a public who do not realize either the danger or the futility of attempting to go faster than fundamental knowledge permits or justifies; a public who do not realize the necessity for experiment and research and who are but little inclined to provide the money necessary and the facilities required.

The problem is not only a problem of accredited herds, of restricted areas and of municipalities and their milk supply; it is a far bigger problem. It is a national and international problem, a world problem, and as such we will have to consider it. There is no need to emphasize the fact that tuberculosis to-day is the greatest single economical factor bearing upon human and animal health that the people of all civilized nations are called upon to deal with.

The relationship between human and animal tuberculosis, which has just been discussed, is a phase of the problem which has been the subject of con-

troversy ever since the famous announcement made by Professor Koch at the International Congress on tuberculosis in London in 1901, to the effect that the bovine infection was not transmissible to man and could be ignored as a factor in public health work. This has been proved incorrect. We know now that bacilli of bovine origin can and do infect human beings, especially children, and this fact has been largely drawn upon in the propaganda work for obtaining the support and money required for campaigns against bovine tuberculosis. However, even at the present time, there is a wide divergence of opinion as to the degree of importance, of danger and of the ultimate effect of bovine infection in human beings. Some authorities go so far as to state that a mild infection contracted in childhood may be completely arrested and very often eliminated, leaving behind an immunity affording a relatively high degree of protection against infection in later life; in other words acting as a natural vaccination.

The evidence has shown that the great majority of human beings will react to tuberculin if tested at some period of childhood life, and it is true that the great majority of these human reactors survive this early infection and do not die of tuberculosis. What happens in cattle? That we do not know with certainty or with accuracy, as yet. That is a subject for further research, but we do have certain evidence to guide us. You know of the experiments made under the Bang system. The great scientist, Professor Bang, made a statement as long ago as 1891 when the tuberculin test was first being applied, and Cattle Breeding. The statement he made was that in herds in which a majority clearly understood that this great number meant that the majority of the cows were infected, and by no means signified that the majority of the cows to death and after a longer or shorter period would succumb to tuberculosis; it appeared that the great majority of the animals suffered a very limited and often quite insignificant form of infection, and from observation of the fate of such animals in herds which were allowed to live and which were examined when ultimately destroyed, it would seem that in a majority of cases the disease did not develop, but on the contrary tended to decrease or disappear. It was such experiences which led Professor Bang to introduce that very Bang system which you have been discussing.

In the present-day-haste to make progress and achieve quick results we are apt to overlook the important observations made by Koch, Bang and Nocard, and still being made by Calmette and others relative to resistance to tuberculosis; a resistance that may be acquired through early infection, and also by artificial vaccination.

In propaganda literature, by the way, and in addresses so frequently delivered on this continent in support of campaigns for the eradication of tuberculosis the slogan is frequently used "Once a reactor, always a reactor", modified later, when found to rest upon a too dangerous assumption to "Once a reactor, always tuberculous". Neither is a scientific fact neither conveys the truth. Both are objectionable.

It is still frequently said that if a herd of tuberculin reacting cattle be allowed to live they will all sooner or later develop tuberculosis, and eventually succumb to it. That also is not true. From my own experience in certain experiments and observations made during the past five years at the research station across the river, I can add confirmation to what I have just read to you of the statement made by Professor Bang, that a fair percentage—I am not going to say what percentage—of animals in a tuberculous herd exposed to continuous infection, do not develop tuberculosis. They are reactors, though not always constant. They have acquired a relative immunity through a natural process of vaccination, and when you come to slaughter them you find

perhaps a minute lesion, no bigger than one or two peas, calcified, healed, not dangerous, and some do not have any lesions at all, not a trace of tuberculous infection remaining. That is being demonstrated more and more frequently where research work is carried on. Of course the question of all questions in connection with present campaigns for tuberculosis eradication in cattle, advocated by some and condemned by others, is the question of what to do with reacting cattle. The condemnation and slaughter of all reacting cattle includes not only those which are dangerous spreaders but those which are not spreaders; those which are no longer tuberculous, which have acquired a relative immunity, and which as we can show by experiment are more resistant to reinfection than cattle which have never reacted to tuberculin. That is the unfortunate fact, that these have to be, in our present state of knowledge and lacking further facts, included in the slaughter of reacting cattle.

In recent years many efforts have been made to devise supplementary tests, blood tests serological tests and even chemical tests; something that will enable us to classify reactors in a different way as, for example dangerous reactors, safe reactors and immune reactors. The progress made along these lines is distinctly encouraging, and worthy of a great deal more effort than we are at present able to give to it.

The slaughter of reacting animals and every plan of tuberculosis eradication which demands it, in my opinion should be regarded as a temporary measure or plan at most—the best possible under present circumstances—a plan for checking the spread of tuberculosis and controlling it within practical limits until, by further research and experiment, we are in a position to introduce a more thorough and efficient plan, a less costly plan, involving less sacrifice of animal life. The most enthusiastic supporters of the present plan and many of those who have promoted it, are not of that view, I am aware. They regard this plan as a permanent plan for the total eradication of tuberculosis; not as a temporary measure at all; and the argument they advance very often is that because it is possible to apply that plan successfully to a single herd it is possible to apply it to a large number of herds, to an area or to a county, to a state or province, and therefore to eradicate tuberculosis from the whole country. I think the weakness of that line of argument is too obvious to deal with.

As illogical and equally valueless, would be to say that because tuberculosis may and frequently does recur in accredited herds, reinfection occurs in all herds; therefore, the plan is no good. Neither argument is worth considering. Frequently we must admit that we are at an entire loss to know or explain why recurrences take place in an accredited herd.

One of the weaknesses of the tuberculin test is that occasionally it may not provoke any visible reaction in an animal in an advanced stage of tuberculosis and when that animal may be disseminating infection to a far greater extent than any of the other reacting animals in that herd. Such an animal may escape detection until it dies or reaches the slaughter house.

In addition to that, there are a number of other sources of infection which disinfection of stables will not eliminate, and which with our present limited knowledge, we are unable to guard against or clearly define.

Recent investigations have shown that bovine infections in man and avian infections in mammals are very far from being rare. We know that swine and even horses become infected with both the bovine and avian type of infection.

These undisputed facts direct attention to the inter-relation between all types of human and animal tuberculosis, to the consideration of the problem as a whole and to the futility of attempting to eradicate all sources of bovine infection by the slaughter of reacting cattle.

Cattle may absorb tubercle bacilli from human sources and in consequence react to tuberculin. They may also react to the absorption of bacilli disseminated by infected swine and poultry; horses, dogs, and cats, are also susceptible to the so-called human bovine and avian types of tubercle bacilli, and may

become carriers, spreaders, or hidden sources of infection. Thus, the contention that bovine tuberculosis can be *eradicated* by the slaughter of reacting cattle rests upon a very insecure foundation. Whatever the actual relationship is between human and animal tuberculosis or between the different types of tubercle bacilli infecting different species of animals, these ubiquitous bacilli should be recognized as members of the same family, or genus, and each member thereof must be studied, taken into consideration, and regarded as a factor in the tuberculosis problem as a whole.

I want again to make it clear that I am not opposed to present plans or policies of dealing with bovine tuberculosis, if regarded as temporary measures, the best possible temporary measures, as I said, aiming to check and to reduce tuberculous infection, until we are in a position to modify or even to change them for a more efficient or more logical system. The accredited herd plan, in my opinion, is an excellent plan for certain purposes, but there appears to be little justification for the expenditure of such large sums of public money for so-called tuberculosis eradication, unless a goodly portion of it, all that may be required for proper facilities for research is clearly ear-marked for that specific purpose. There are many ways of providing for this which it is not my duty to go into, though I might mention, for example, taking a percentage of the compensation that is paid, and applying that to research. The question for or against an indefinite continuation of indemnity payments should be given careful consideration. Would it be less costly and perhaps in the long run more satisfactory to establish, say, in each province, at different points, a tuberculosis centre for education, research and experiment and to remove to such centres some of the best strains of reacting cattle instead of slaughtering them, to propagate those strains, raising healthy cattle from tuberculous cattle, as can assuredly be done under proper conditions; and instead of paying compensation, replace the diseased animals with these healthy animals? Might it not even be more logical to pay a premium for herds maintained free from tuberculosis rather than to pay an indemnity for diseased animals?

However, I believe that the ultimate solution of the tuberculosis problem lies in protective vaccination, and that vaccination can be accomplished, inasmuch as it does occur naturally and spontaneously in an immense number of human individuals and animals, in consequence, as many have pointed out, of a mild infection contracted in early life. Many attempts during the past forty years have been made at artificial vaccination and lately great attention has been given to the method introduced by Professor Calmette, of the Pasteur Institute, France. Calmette is recognized as one of the greatest living authorities on tuberculosis, and without doubt his method requires the closest possible attention and scrutiny, and not until it has been submitted to searching investigations and experiments

Mr. WARNER: Mr. Chairman, is a question in order at the present time?

The CHAIRMAN: Dr. Watson, would you prefer to answer questions now?

The WITNESS: I think I would just like to finish on the Calmette method of vaccination, if you don't mind. To continue, not until Calmette's claims have been submitted to a thorough trial or investigation on a number of animals in the hands of reputable investigators, will it be possible to pronounce as to the efficiency of that method of vaccination.

However, there are one or two points to which I will call attention, which to me are of great interest and importance. Calmette stated that these young cattle react positively to tuberculin during the whole period of acquiring immunity. That is, cattle he had vaccinated. He states this immunity lasts about fifteen or eighteen months, and during that period the animal reacts to tuberculin. They cease to react about the end of that period and they thereupon become as susceptible as any other animal which has never reacted. That, from a scientific point of view, is of very great interest indeed, because it has

a striking analogy in the natural vaccination that occurs in a large number of infected animals. I could give experiences in this connection, with which we are all familiar. For example, a valuable bull reacts to tuberculin. The owner wishes to breed the bull for a year or more and is allowed to do so. The bull was isolated from his tested herd. Twelve or eighteen months later the tuberculin test was negative. The owner wanted to get his accreditation certificate so he decided to kill the bull. He killed the bull, and no lesions were found. Is that not the same thing, almost, that happens with Calmette's vaccination; that is to say, a temporary reaction and a temporary period of immunity, following absorption of bacilli? No development of tuberculosis. It seems to me that is quite analogous to many other cases where we get no lesions. So-called "no lesion cases" cannot be wholly explained by the fact that a certain percentage of such cases are found to be tuberculous by laboratory examination. That is true in some cases but a great many no-lesion cases, I believe, are due to a natural vaccination, just like the bull mentioned, and like many other animals in a tuberculous herd that have acquired a relatively mild form of infection. They have reacted, and later on, when the immunity has worn off and not been renewed they cease to react.

When I came in, the chairman reminded me of meeting him down in Quebec and of a particular herd where many animals reacted but very few showed any evidence of tuberculous infection. The history in that herd was very suggestive of the natural process of vaccination and immunity of which I have spoken.

I would just like to point out that where we are most lacking in knowledge and where further research is most needed is in connection with this same tuberculin reaction. A tuberculin reaction indicates that the animal giving it has undergone infection or has absorbed tubercle bacilli. That is about all that we can say at the present time. It does not necessarily indicate progressive tuberculosis, nor the stage, or the degree of infection. The real nature of the tuberculin reaction is not known or understood; neither is its relationship to resistance and to immunity. Tuberculin itself has never been isolated in a pure state, and still defies an exact chemical analysis. These are fundamental questions which must be pursued.

Our knowledge of the reaction of the host to tubercle bacilli, living or dead, and to the products of those bacilli, living or dead, is still very vague. Fundamental facts relating to tolerance, resistance and immunity are lacking. Protection against tuberculous infection is as important, or of more importance even, from my point of view, than the eradication of tuberculosis already existing, and probably is the more practicable and less costly objective in the long run. The problem demands the most intensive study that can be given to it and the exploration of new fields of research and avenues of approach. Our facilities for this are deplorably inadequate and it seems incredible that we can spend millions of dollars in paying out indemnities and maintaining an elaborate inspection service and be denied modern facilities for advancing knowledge that must be revealed before the solution of the problem can be found. At the present time for studying this great problem of tuberculosis we have a station where there is accommodation for about 12 head of cattle and half a dozen calves, a building for some guinea pigs and rabbits and a room in a quaint old residence, in which I have my living quarters, as a laboratory and workroom. That is all. Surely, a building should be provided with all modern facilities and the most accurate equipment that can be secured, with a specially trained staff of research officers for further studying this greatest health problem which we have to deal with. It would seem only good business and only good common sense to provide for this. If we are to become more than mere operators of a plan or a time-table, and advance to the real solution of the problem, we must have the means.

By Mr. Warner:

Q. I would like to ask the Doctor at what age it would be advisable to do the first vaccination?—A. As soon as possible. Professor Calmette insists, with his method, that the calves should be vaccinated within fifteen days of birth, but his reason for that is that in France and the older countries, where tuberculous infection is so rife, he thinks it very unlikely that calves, under natural conditions, would escape infection even for three or four weeks; therefore, he insists that the vaccination must be done as soon as possible after birth.

Q. I understood there was to be a second vaccination?—A. The immunity lasts, as he says, probably not more than fifteen or eighteen months, and, therefore, it would be necessary to revaccinate at the end of such periods or at yearly intervals.

Q. As regards the human vaccination: I did not just catch whether that had been carried on. Was there any way it could be prevented?—A. No. Human vaccination has scarcely been attempted, as yet. Calmette has suggested a form of vaccination treatment in very young children and I believe that trials are now in progress. He is experimenting mainly on monkeys to determine the safety of his method and the protection afforded.

Q. Do the scientists think the human tuberculosis can be controlled in that way? Would it lend itself to that sort of treatment?—A. It is the goal of all their hopes—what they have been trying for and seeking for generations, and they are giving this method of Calmette and others as well, very careful trial. They are experimenting, first in the laboratory, then on calves and experimental animals, but, of course, they cannot pronounce at the present time nor until the experiments are complete, what effect it will have. But it is a sure thing, from what we have seen and learned from the introduction of previous attempts at vaccination, with von Behring's bovo-vaccine and others, that Calmette's discoveries and methods mark a distinct advance and brings perceptibly nearer the possibility and the probability of vaccinal immunization against tuberculosis.

Mr. LEADER: Mr. Chairman, I am sure that we were all very much interested in the address of Dr. Watson, but it seemed to me that it will have the effect that the new theology will have when applied to the old time religion; it will kick the props out from under it, and we will want to give up the whole thing. I would hate to see that. I think his remarks have thrown cold water on the system which we have, and I should be loath to give up what we already have to go back for more research. Not that I am against it. At the Live Stock Breeders' meeting in Calgary, we passed a resolution commending the Government for their action in eradicating bovine tuberculosis. We also told them we would support any measure whereby more definite research would be carried on. I am speaking now as a live stock man in saying we are heartily behind the Government in asking for more research work, and we should provide the facilities. I want to be clearly understood as not wishing to give up the weapons we have in combatting this disease, the most loathsome in the whole category of diseases.

The WITNESS: I was a little afraid that possibly some of my remarks might be a little bit misunderstood. (Make no mistake! The 'new theology' is embodied and practised in our present campaign methods, and is now on trial. The 'old time religion,' with an added chapter of revelation, still stands.) Certainly I do not advocate that we should abandon plans in progress at the present time. As I have said, we have to do all we can, in a practical way, to limit the infection and to keep it from spreading as it has done in Europe, and we are doing that, reducing it to a considerable extent and accrediting a number of herds by the present plan. I do not want it to be understood that I am trying to throw cold water on this plan at all; on the contrary, let us widen it and improve it, but we should not be like the ostrich, and bury our

faces in the sand and refuse to face facts. To advance, we must see where we are going and know what we are doing.

By Mr. Warner:

Q. I was just going to ask if research work or experiments have not gone far enough to pretty well determine whether vaccination is effective?—A. It has been shown to be possible, gentlemen, to protect cattle and to give them a fair degree of protection, by methods of vaccination; but these methods of vaccination have been too dangerous to put into practice up to the present time. Experimentally, cattle can be protected against bovine tuberculosis by vaccination with weakened human bacilli. In von Behring's bovo-vaccination and modifications of his method human tubercle bacilli are used. Unfortunately, with these methods, the animal continues to carry in its system the human tubercle bacilli which give it protection against bovine tuberculosis and it may disseminate this human bacilli through a number of years, and so be a source of danger to public health. Therefore, that method of vaccination has failed, though it does give protection. Calmette's method, and methods which we ourselves are endeavouring to work out aim to give protection without the danger of spreading infection, but at the present time we have no method which it will be safe to apply.

By Mr. Caldwell:

Q. In speaking of the necessity and practicability of prevention, would you go further and say that prevention could be carried on by the owners of the cattle having more sanitary stables? In fact, all these other methods are no good unless the stables are sanitary? In that same connection, while I am on my feet, may I say that these restricted areas of tuberculosis eradication compel every person in that area to comply with the regulations as regards proper stabling, whether they wish to or not?—A. In answer to that, gentlemen, on the question of sanitary stables and disinfection as a prevention against a recurrence of tuberculosis; it seems to me that even if you had a thorough disinfection of the stable—and that is a difficult thing to accomplish, as we know—there are many other sources of infection on the farm upon which you have not touched. There is perhaps more danger outside of the barn than in the barn. How would you disinfect the farmyard, the droppings and the manure pile, and the horses, swine and poultry, and all the possible carriers and sources of infection? Disinfection of the stable is an excellent thing, but there are many other sources of infection of which little or no account has been taken; and even where the best systems of disinfection have been followed, and with barns of the most modern type, it may happen that tuberculosis appears and reappears.

By An Hon. Member:

Q. Is the tubercular germ not disseminated as much through the breathing as in any other way?—A. Not in cattle. In a cow the bacilli may come out of the lungs—in a pulmonary infection—into the mouth and may escape with the saliva but more often they are swallowed when they reach the mouth and expelled in the faeces. It may be of interest to recall an exposure experiment made by Doctor Schroeder, of Washington. At his experimental station he has a tuberculous herd of cattle which he has maintained from year to year, and in which the most virulent forms of tuberculous infection were constantly present. Running parallel with this stable was another stable in which he has maintained a healthy herd of cattle for a like period, and he has never had a case of tuberculosis develop in that stable only 28 feet away from the tuberculous stable. The windows of each stable faced each other and were open; if the bacilli were expelled in the air, that healthy barn could not possibly have escaped infection. The only precaution taken was to forbid those attending the diseased stock to enter the healthy stable and to prevent forks, rakes, brooms, etc., used in the infected stable, from being taken elsewhere. As the result of

that experiment continued, I believe, for over 10 years, the inhalation theory is scarcely applicable to cattle infection. There is little danger in that connection.

Q. There is in the human, is there not?—A. There is far more in the human, admittedly—supposedly, at least. I am not in a position to discuss that.

By Mr. Stewart:

Q. I wonder if you would just make this point clear. I gathered from your remarks at one point that you supposed an animal becoming infected with a mild form of this and recovering later became resistant to infection, or more resistant to infection; then when you came to this theory of Calmette where his inoculation loses its power in 18 months—have there been any experiments to show whether that animal is more resistant after having been once inoculated with the serum?—A. Calmette states that after that period of 18 months or so when the immunity is gradually lost—the animal behaves as another animal would, never having been vaccinated. That is to say, it is susceptible to infection practically the same as a non-vaccinated animal. At the same time we must remember that he draws attention to the fact that in an animal already infected—this is why he insists upon vaccination at the earliest age—in an animal already infected the introduction of his vaccine may bring about the very opposite result to what is wanted, namely, a severe development of the tuberculous infection existing in that animal. In other words, it is toxic, definitely toxic, for the animal already infected. That is why it is of no value whatever as a curative, as a remedy for an animal already infected; the animal to be vaccinated must, in the first place, be definitely ascertained to be free from infection. That is an essential condition he insists upon. Do you see the point?

Q. Yes, but did I understand you right in believing that you made the statement that an animal that was infected at one period, after recovering became resistant?—A. Quite so. I do believe that. Observations such as we have made ourselves upon animals of Bang herds, animals I have had under my observation five or six years, which, as I say, were purposely exposed to virulent infection for years, in association with other animals that died of tuberculosis, showed that they were extremely resistant—one animal even, out of a herd of twelve, after five to six years, had not a trace of tuberculosis in it at the end of that period. It had reacted for two years and then ceased to react, or reacted very slightly afterwards; and the same occurred with other animals in the herd. I do believe that if an animal overcomes a first infection it is better able to resist later infections. A tuberculin reaction means infection, not tuberculosis, although the public as a rule do not see the difference. It is very important, however, to distinguish between infection and tuberculous disease. Infection may take place with a few bacilli which may never produce a visible tubercule, or lesion, if you understand what I mean. They will cause a tuberculin reaction even by a temporary multiplication in the blood or organs. They may be eliminated by natural channels, and never produce a tubercule or tuberculosis. We can do that experimentally with certain strains of tubercle bacilli and by different methods of inoculation.

Q. Could you not offer some suggestion to harmonize your theory there with Calmette's observations?—A. I think they do harmonize more or less.

Q. It seems to me there is a discrepancy. You say in your opinion an animal that is infected and recovers is resistant. In the other case, apparently, there is no resistance.—A. Exactly. Let me explain that. In my herd, that resistant animal was, as I said before, kept out in the summer time in a corral which was purposely never cleaned out, where the manure was a continuous source of infection. They were kept together in that corral, and those animals, under certain conditions like that, develop immunity, a natural immunity by natural repeated vaccination. Their vaccination is being kept up year by year

by absorbing bacilli from that manure pile or somewhere else. In other words, nature can do periodically what Calmette has to do every year.

By Mr. Warner:

Q. I understand that your idea is that we go ahead with the same system that we are using now until further research work is carried on, and until we know whether we can adopt another system, rather than to dispose of this one until it is perfectly worked out?—A. Exactly right.

Q. I see no danger if that is the idea?—A. Quite correct, sir.

By an Hon. Member:

Q. I would like to ask Doctor Watson what inference he draws from the fact—I think it is an established fact—that there is very little bovine infection in children of the pulmonary type; it is confined more to the bones and so on?—A. That is true. One question we ask ourselves very frequently is, does the receptivity or susceptibility to infection in different animals result from a difference in the bacilli, the types of bacilli infecting them, or is it the result of a difference in the animal reactions themselves? I think it is a difference in the animal reactions themselves. We can take one known type of bacilli and in a certain species of animals it produces more or less one type of infection, say the pulmonary type, and in another animal species the glandular type or the visceral type and so forth, and thus we are aware of the relationship of all tubercle bacilli in all species of animals, but producing not always the same characteristic result in different species of animals. The bovine type produces in children usually in glandular type of infection, not the pulmonary.

Q. Right there, in answer to a question a short time ago about the infection from the breathing, you said it was very slight. Would it not seem that the infection in children in the glands, in the bones, and in the abdomen would be due more to drinking milk from such cows?—A. Unquestionably. That is the opinion to-day, that bovine tuberculous infection in children is the result of the drinking of unpasteurized tuberculous milk. Pasteurize the milk and you will probably overcome its danger.

Q. Is it not, then, more a question of contact than the peculiar effect upon that particular animal, the child, on account of the milk going to the abdomen and being sent to the other parts of the body, the glands and so on, more particularly than by the breath going to the lungs?—A. I am afraid I do not quite follow. You mean the course of infection, the channel?

Q. You made a statement that the infection in any particular organ was peculiar to the animal which was infected?—A. Yes, in a sense.

Q. That is in reference to the source of infection?—A. Yes. I must modify or qualify that by stating that we do not know how long a period of time or how many passages in a certain species of animal are necessary before the lesions produced become more or less fixed to a certain type. Do you see what I mean? Adaptation, and the result of adaptation in certain species of animals changes the characteristics of bacilli originating from other animal species.

By Mr. Brethen:

Q. I suppose, following out that reasoning, you would naturally come to the conclusion that tubercular milk fed to a healthy child would produce tuberculosis in the child?—A. Tuberculous infection is like vaccination; it depends upon the degree and the amount. I suppose most of us, in fact the great majority of us have been infected with bovine tubercle bacilli in our childhood. It may not seem comfortable to believe that, but it is practically so, and so long as we are not subjected to massive infections, massive and multiple reinfections, we will carry our immunity. That is more or less the opinion of the scientists in the medical field who are studying immunity in the human. It all depends upon the kind and the degree of infection; it may work like a vaccination. If you

get a few weakened bacilli, it may increase your resistance; if you get too many and too virulent you may go down and die of tuberculosis.

By an Hon. Member:

Q. You made a statement, I believe, that the weakness of the present system lies in its inability to detect badly infected animals?—A. Yes, occasionally that is one. Certainly we meet that condition at times; an animal which has not reacted, but which for some reason arouses suspicion on the part of the owner, does not seem to do quite as well as it should. The animal is finally slaughtered, and is found to have not a lesion, but a mass of tuberculous infection, the lungs solid. When they reach a certain stage, unfortunately, all resistance may be lost, and the animal cannot react to tuberculin. The tuberculin reaction depends upon a certain degree of resistance to infection. If that resistance is entirely lost, there is no reaction and the animal may be left in the herd.

By Mr. Pritchard:

Q. I do not believe that is a very common situation?

Dr. HILTON: It is very exceptional.

Mr. PRITCHARD: Gentlemen, I think we might pass a vote of thanks to these gentlemen for the instructive addresses they have given.

Mr. WARNER: I would move that a vote of thanks be tendered.

The CHAIRMAN: I have pleasure, gentlemen, in expressing the thanks of the committee for your attendance this morning.

The Committee adjourned.

SELECT STANDING COMMITTEE ON AGRICULTURE AND COLONIZATION

HOUSE OF COMMONS,

March 26, 1925.

The Committee met, Mr. Kay, the Chairman, presiding.

The CHAIRMAN: Gentlemen, we have Mr. Newman, this morning, and he will address us on the production of wheat and other grains.

Mr. NEWMAN: The title of my address as printed is "A brief history of cereal breeding work and its influence on the agriculture of the country." When the Experimental Farm System got into action about 1888, Dr. William Saunders, its first Director, recognized that one of the most pressing problems at the time in Canadian agriculture was that of producing a wheat for the western provinces which would be superior to the old Red Fife variety, particularly as regards date of maturing. Although Red Fife was quite productive, it was too late in many districts and, in many cases where it was grown, farmers suffered severely from losses due to frost. Dr. Saunders first carried on some selection work with some of the old varieties, but failing to achieve his end in this manner, he imported from other countries a number of promising wheats, some from Russia, some from India, some from China and from other countries. Among the numerous varieties he brought in was one called Ladoga, which was fairly early, fairly productive, not very strong in the straw, but which looked promising. When a sufficient quantity had been produced to permit a milling and baking test to be made, it was found that this variety was not a good quality wheat. However, it was early and therefore was crossed with Red Fife and White Fife, and as a result Dr. Saunders produced four new wheats, one called Huron, one Preston, one Percy, and one Stanley, which were placed on the market and which were of very considerable value. I have a sample here of the Huron wheat which is the wheat we recommend for eastern Ontario and Eastern Canada generally. It is a very strong strawed wheat, standing up under almost any circumstances, a good yielder and of reasonably good quality for domestic use. We do not recommend it for export. We have also found Huron to possess considerable rust resistance, and we are using it, to quite an extent in our breeding work, in connection with the wheat stem rust problem.

None of the above wheats, unfortunately, were quite as good in quality as they should be, so Dr. Saunders sought for other varieties with which to cross Red Fife. He had the good fortune to obtain from India an early wheat of good quality called Early Hard Calcutta. This wheat, however, was not very strong in the straw nor was it very productive. He had a number of crosses between these two varieties made and, as a result, there was produced the famous Marquis wheat with which you are all familiar, a wheat which has meant millions of dollars to this country. In 1923, I made an estimate of what it was worth, over and above what Red Fife would have been worth to western Canada in that one year, on the basis of our Experimental Stations' actual yields for over ten years. It figured out at something over \$50,000,000 for the one year, to say nothing of the extent to which the wheat growing areas were extended by the introduction of that wheat. Marquis has been a decided contribution. It was developed and introduced by Dr. Charles Saunders and is now grown very largely throughout the west. It occupies, according to statistics, about 90 per cent of all the spring wheat grown in western Canada, and about 70 per cent of

the spring wheat of the United States. It is found in practically all the states of the Union. Marquis, however, is not resistant to rust nor is as early as we would like to have it. It is a fine quality wheat, and enables Canada to maintain her reputation, but still we are always looking for something better and we believe we have something now that may possibly be better than Marquis, in at least some districts.

By Mr. Warner:

Q. Did you say 70 per cent of the United States crop?—A. Seventy per cent of the spring wheat raised in the United States, not of all the wheat they grow. The greater percentage of the wheat in the United States is autumn sown, but still they grow a large acreage of spring wheat, and, of that, 70 per cent is Marquis. It is rather interesting to note in this connection that Prelude, a wheat we do not speak of very much now, a wheat originated at Ottawa, is grown down in the southern states to patch up areas of fall wheat of such varieties as Kanred which is sometimes killed out in patches. They find that our Prelude wheat can be sown in the spring on these patches and will mature with Kanred. They find it yields fairly well. I was quite pleased to hear Prelude spoken of so well in Nebraska last year.

In our search for still better varieties, we are prosecuting our crossing and selection work with the greatest vigour. We hope to have a greenhouse this year in order to test out our new productions and to continue our crossing work during the winter. We also are working on many crosses which Dr. Charles Saunders left behind him and which are exceedingly promising.

I would like to speak particularly of two of these. You have heard of them before, so they are no particular secret now. One we call Garnet, and the other Reward. Garnet is a crossing made between Preston, one of the wheats I mentioned before, and Riga, a wheat from Russia. Preston is an early, good yielding wheat, possessing fairly good straw, but its outstanding feature seems to be its relative ability to withstand drought. Unfortunately, it does not produce the best type of flour for export trade, and it shatters rather badly. If the drought resistance of Preston could be combined with the good qualities of a wheat like Riga, we might get something valuable and in Garnet we seem to have obtained that combination to a very considerable degree.

By Mr. McMaster:

Q. What does "shattered" mean?—A. It means that when the wheat becomes ripe, it shells easily in the handling. It shatters off the head. Marquis is very outstanding in its ability to withstand shattering, while Ruby is a wheat that shatters quite easily.

By an Hon. Member:

Q. Will you explain what happens to a wheat like Ruby when a windy day comes along when the wheat is ripe?—A. Yes. When such a variety is ripe, it will very easily shell out in a wind and you may lose quite a percentage of the wheat on the ground. The ability to resist shattering is an important character in wheat, as all practical growers know. That is one thing we are watching for and one reason we are interested in Garnet, because we believe that it will take the place of Ruby. Ruby is about ten days earlier than Marquis; Garnet is eleven days earlier than Marquis, or one day earlier than Ruby. Ruby has attained considerable popularity because of its earliness, although it is not a very good yielder and shatters. Garnet is one day earlier, and does not shatter, and on the average of seven years at three of our leading experimental stations, it has equalled Marquis in yield.

By an Hon. Member:

Q. Has it a stiff straw?—A. It has a good straw. It is not rust-resistant but, in many cases, we believe it may be rust-escaping. It will be included in our rust nursery work in Winnipeg this year, and it will also be used in connection with a large number of local variety trials which are being conducted throughout the west and in the north in order that we may be in a position next fall to make a reasonably definite pronouncement regarding its merits.

By an Hon. Member:

Q. Did you mention what its milling qualities were?—A. Its milling qualities seem very good, as far as we are able to judge at the present time. We are making baking tests at present. We have a modern laboratory and are testing all these varieties from the different experimental farms. Last year at Saskatoon, where they carry on very extensive tests, Garnet led the lot in yield, and 1924 was one of the driest years they have yet had at Saskatoon. We are hoping that this variety may be a real contribution, especially for the drier areas throughout the west, and other districts which need a particularly early wheat.

By an Hon. Member:

Q. By how many bushels to the acre did it beat the others?—A. At Saskatoon last year?

Q. Yes.—A. I have not the exact number of bushels by which it exceeded the next best; all I have is a statement from Professor Champlin that this headed the list at Saskatoon.

In the Peace River district, which is also fairly dry—very dry last year—this wheat did relatively well and is the one that is now being recommended by the superintendent.

In the Dauphin district, which represents an entirely different type of district from most of the west—that is, it is a place where summer frosts are frequent and where there is usually plenty of moisture—we had three men last year conducting local variety trials with Garnet, Reward, Marquis, Kota and three or four other sorts. I was there on the 6th of September and found both Garnet and Reward mature and standing about three and a half feet in height. Marquis was about ten inches higher than Garnet and would not be ready to cut for two weeks. The former was at that time showing very decided damage from frost and some from rust. The point is that Garnet wheat was ready to cut at that time and showed no damage from frost whatever, whereas the others, including Marquis, showed quite a percentage of damage and would not be ready to cut for two weeks. One of the men, a bright intelligent chap who is very apt at figuring costs closely, exclaimed: "Man, what would it mean if all my wheat were like this fellow," pointing to Garnet. "Look at the twine I would save!" That is a point a good many people would pass over, but you men know it is an important item. "Look at the extra handling and labour that rank growth of these other varieties would require," he said, and, "what would it save me if I could get my whole crop threshed before the bad weather comes?" This wheat and Reward also, of which I will speak presently, standing side by side, were both ripe and ready to cut. Garnet does not seem to fluctuate in growth with variations in moisture as do many other varieties. Under very dry conditions, Garnet might attain a height of approximately two feet. Marquis and many of the other wheats might attain a height of scarcely one foot. On the other hand, under extreme moisture conditions, Garnet may attain a height of three and a half to four feet whereas Marquis and some of the other wheats may be from ten inches to a foot taller, thereby requiring a much larger amount of twine, and so much extra labour to handle.

The Reward variety, in which a good many people are interested, is one of our finest looking wheats. It is a finer looking wheat than Garnet, but so far

has not shown that it is able to compare with Garnet under dry conditions. It suffers very severely under dry conditions. It is a cross between Prelude and Marquis.

By an Hon. Member:

Q. Has Garnet reached a stage where it is available to the public?—A. No. We are multiplying every pound of it this year. We anticipate, if the year be at all normal, that we should have around 12,000 bushels next fall to place on the market, probably in lots of not more than 25 bushels each, and at a reasonable price per bushel, providing it is decided to let it out. This is all being propagated under our own supervision and on our own farms except in one or two cases. There are some three places where we are having some grown under contract on farms adjoining our experimental farms, but it will be handled by our own staff, in order that we may keep complete control of it and so may have this year's data to add to what we have already collected.

By an Hon. Member:

Q. Is it a better milling variety?—A. Just as good, so far as we know at present.

By an Hon. Member:

Q. Are you testing any Reward in the Swan River district?—A. Yes.

Q. Is Garnet affected by rust at all?—A. Yes but we feel that it may often escape rust as it did in 1924. I might mention that Marquis and the other varieties tested in this district were showing quite a lot of rust and would certainly suffer from it before they ripened, if they did ripen.

By an Hon. Member:

Q. Have you considered that this variety may offer a solution of the problem in southern Saskatchewan and southeastern Alberta, where there are large districts in which they thought it would be necessary to move the settlers out?—A. All I can say at present is that in tests we have conducted thus far, Garnet have been outstanding in its ability to thrive relatively well under very dry conditions.

By an Hon. Member:

Q. What would it yield under these conditions?—A. In places in northern Saskatchewan where it was tested this year, it yielded at the rate of 20 bushels, where Marquis went down to about nine bushels and would grade No. 1 northern against Marquis, No. 1 feed.

By an Hon. Member:

Q. What was the yield at Lacombe?—A. It has yielded slightly more than Marquis at that place and matured about 9 days sooner. I might say that we have a sister sort of Garnet called Producer, which has been outstanding at Lacombe for a number of years. It is very similar to Garnet, but about four days later. We have some lines, which we call pure lines, out of Producer now, as well as some out of Garnet, which promise to excel either of these by quite a considerable margin. We are testing the best of these.

By an Hon. Member:

Q. You used the expression "pure lines"?—A. Yes.

Q. What is that?—A. That is a line or strain tracing back to a single plant and which, in succeeding generations, will reproduce itself true to type. Some varieties of some of the newer crossings will split up. They constitute a composite race. A pure line is something which will reproduce itself true to type.

Q. Fixed?—A. Yes.

Q. What is the reason for the drought resistance of Garnet?—A. I do not know. We are having some experiments conducted at the Experimental Station at Swift Current where they have facilities for determining the water that is used by these different varieties. They are testing this and some three or four other varieties, in order to obtain some light on this question, if possible.

There is another very interesting thing about Garnet which showed up last spring. You, from the West, will recall the severe frosts that occurred during the early growing season when the wheat was coming through the ground. Much wheat was frozen back. Garnet at Morden, where they suffered severely—came right along and did not seem to suffer any particular damage. I have sent some of this wheat, with three or four others, to the University of Illinois where they have facilities for growing wheat under widely different degrees of temperature, with the hope of gaining further information regarding its hardiness.

By an Hon. Member:

2. You spoke of wheat from Russia and India. Have those two countries made contributions?—A. Yes, the Indian variety, Early Hard Calcutta, was crossed with Red Fife which came originally from Russia and many combinations were effected. One of these had the earliness of the Calcutta parent linked with the high-producing qualities of the other and was named Marquis.

Q. The good qualities of both parents?—A. The good qualities of both parents, and that is what we are after in all our breeding work.

Q. Have you any suspicion of where strength to resist drought comes from?—A. Not unless it may be due to reduced leaf surface. Hannechen barley, a narrow-leaved variety is recommended in the northern part of the Prairies—Saskatoon and West—because of its apparent ability to withstand drought. But where there is more moisture, as in Manitoba, we say “Do not touch Hannechen.” We believe that the ability of this variety to withstand drought may be due to the small leaf surface which permits a smaller amount of transpiration as compared with other varieties. That is, however, only a hypothesis. We are trying to find a definite explanation.

The adaptability of different varieties to different conditions is significant. realizing this fact, we have initiated a special plan of “local variety testing” from which we expect to obtain valuable data. We get in touch with some of the best men throughout the country and, working with them, try to determine the variety best suited for their particular districts. We tried out the scheme with fifty men in the West last year and received reports from 49 showing pretty clearly that the system was sound and that it appeals to the practical grower. Some of the best information we got last year was obtained from our work with these particular men, working under normal conditions. They sow this wheat—generally not more than six or seven varieties—in very small plots on the most uniform land. There are 5 drills, each one rod long to each variety. The drills are 7 inches apart. We weigh the seed for each drill, putting the seed into numbered envelopes, and send the whole lot to the experimenter with full instructions how to sow it. As each variety matures, they pluck the heads off the centre three rows, and mail them to us. We thresh the heads from each variety with a little machine we have designed for the purpose and which does the work very quickly, effectively and without loss of kernels. The weight of seed obtained from each variety is then determined. The grower also furnishes certain information which, together with any observations we are able to make ourselves during the growing season, provide data of value.

By an Hon. Member:

Q. Are you growing them this year?—A. Yes. This year, some of these men have asked us to send them a second set, one to put on the summerfallow and one on the stubble. We are encouraging that sort of test. We have these

tests scattered all over the three Prairie Provinces. They are especially numerous in southern Manitoba where we are concerned in wheat rust. We have a number of varieties which we are anxious to compare in that district. We want to establish a relatively permanent corps of co-operators in order, among other things, to establish a link between our stations and the man on the land. We have many new varieties coming on and we want to give these men an opportunity to test them out at the earliest moment. We have one cross between Crown and Prelude, for instance, from which we obtained seed weighing 68 pounds per measured bushel.

Q. What is Crown?—A. It is the same parentage as Ruby a cross between Downy Riga and Red Fife. It never came on the market because Ruby was considered a little better, although Crown has something which excels Ruby from the breeders standpoint.

By an Hon. Member:

Q. Are you depending altogether on crosses to get new varieties, or is some of it done by selection?—A. We are selecting too, but we are making headway quicker by making crosses, with our knowledge of the parents.

Q. It is quicker than selection?—A. Yes. It would be chance work to select from some of the old varieties; one cannot select what is not there.

Q. I wanted to ask that question to see if what you have here are all crosses—A. Yes; these are all crosses.

Q. How many years do you have to grow them before you get a type fixed sufficiently?—A. It depends entirely on the parents that are used and the number of differentiating characters which are involved. The larger the number of characters involved, the longer it takes to get a type that is pure in respect of all characters. It also depends upon the system followed, to some extent. We have initiated, recently, a plan of handling at least some of our new crossing products which, for economy as well as for opportunity to produce something better, is rather unique. The plan is possible of execution by reason of our organization of widely scattered Branch Farms operated under a measure of central control. The crossings are made almost exclusively at Ottawa and as soon as sufficient seed is available, a quantity is sent to certain Branch Farms where it is simply propagated sufficiently for our purpose and maintained in a composite condition for a number of years. In the meantime, each so-called "population" becomes composed very largely of constant forms, thereby providing excellent material from which to carry on extensive selection work.

Q. Can you pick out the undesirable?—A. We pick out the promising types. We let nature reveal the undesirable combinations and at the same time we allow the population to become composed of forms which will breed true as it automatically will, so that when we make our selections, these will breed relatively true from generation to generation. By this system we are able to carry many more crossings (populations) than is possible by the system usually employed and thereby are able to increase our chances of producing something better. This plan also provides our outside men at our Branch Farms, an opportunity of selecting on a large scale and with a good chance of isolating a superior variety.

By an Hon. Member:

Q. If a type be established, will it persist indefinitely?—A. Yes, within certain limits, if it be absolutely constant. The trouble has been in the past with many types which have been considered as being established, that they really have not been.

Q. Does the percentage of fixation increase or decrease in an established type?—A. With the passing of years, there are certain factors which may operate to cause a once established variety to show a greater or lesser degree of variability.

Q. Are we to understand that it may take seven or eight years before you would have a new type ready to go to the public?—A. It would take more than that from the time of the first crossing to the time that the new type had been sufficiently tested to justify its distribution.

Q. Supposing you had decided that one of these fixed types was good, and you took the plumpest berries of that type and planted the plumpest berries and those only, would you increase the plumpness of the berries in that type?—A. Not necessarily.

Q. I remember hearing a story some years ago about a man who was careful to pick out the largest berries and the story is that he improved his wheat. Is that true?—A. It is quite possible, providing he was working with a variety which was composed of strains which differed in respect of size of kernel. Some strains possess kernels which are much larger than the kernels of other strains.

By an Hon. Member:

Q. Take this well fixed type. If a farmer cleans his grain well and sows only the well-matured seed, will he improve his grain?—A. It might not improve the actual yielding power permanently, but if he neglects this care he is not likely to realize as large yields as he otherwise might.

By an Hon. Member:

Q. Would it not depend a good deal on the season as to how much benefit grading of that kind would be?—A. Yes. In some years a well graded sample may outyield a poorly graded one enormously. In other years, say in particularly favourable years, you might not see a great deal of difference.

By an Hon. Member:

Q. What I have reference to is that in some years the wheat will grow nearly all uniform; you can hardly get anything out of it. In other years, only half of it would be good, and to sow that just in a mixed state, poor and good together, you could not expect even in a good year to get as good a crop.—A. No, we always urge careful grading of seed as a matter of good farm practice. That is apart from the breeding end of the problem, of course.

By an Hon. Member:

Q. Is Garnet bald or bearded?—A. It is bald.

I have here some wheats grown at our Station at Fort Vermilion, viz. Red Fife, Marquis and Early Red Fife. We grow some of the best quality of wheat in the west at Fort Vermilion, which is reasonably far north.

In our work in peas, we have some interesting varieties which may be of interest to the members of this Committee. Peas is a crop that used to be grown a good deal. It was considered a valuable crop. I think they should be grown more than they are, especially in the east. We have a new variety called Chancellor which we are propagating now. We ought to have 2,000 to 3,000 bushels of this variety this fall. It is a small pea and takes about half as much seed per acre as the Arthur, Mackay and some of the other peas that you have heard about. It does not split in threshing and we believe it will be an exceptionally good pea for growing with oats for a pea and oat hay combination. It has a long growing straw, very fine, and looks almost like alfalfa coming out of the mow. It matures in about ninety days. We have a variety of oats called Longfellow, a cross between Banner and Tartar King, which will mature with this, if allowed to mature, and which we believe will be very useful to mix with this variety of peas to grow as a pea and oat hay. Longfellow has a long, leafy straw and is reasonably strong. One could allow a patch of two or three acres to mature so that he might get his own seed. This is important, especially in the west. It is expensive to bring in seed for any considerable distance. In fact, seed peas are usually expensive anywhere nowadays. We

had a quantity of these peas grown this year under contract. Our grower harvested between 30 and 35 bushels to the acre. We sold this to a seed centre in Quebec. A number of men in a certain district interested in peas wanted to get a good soup pea. We were interested in getting the people growing seed so that considerable quantities might be available.

By an Hon. Member:

Q. What centre in Quebec?—A. In the Temiscaming district.

By an Hon. Member:

Q. What makes some peas good for soup and others not?—A. That is partly a variety question, I think, and partly a matter of soil. We are investigating this matter this year. It has been generally believed that peas grown on clay soil make better soup, but our information so far, does not indicate that. It would seem that on a loamy soil after a crop of potatoes, you will get peas that will break down in cooking much more readily. But we would not care to say anything further about this until we have conducted further tests.

By an Hon. Member:

Q. What is the length of time required for ripening?—A. About ninety days for Chancellor.

By an Hon. Member:

Q. In the west?—A. Yes. We have had them tested on all our farms, and we are putting this out on some of our local variety tests this year. We believe that in the west, as well as in the east, a pea and oat mixture for hay is a most valuable crop.

By an Hon. Member:

Q. Especially when they get moisture?—A. Yes, they need moisture.

The Forage Crop Division has undertaken this year to test out different combinations, different varieties and different grades of seed. A variety called Mackay, a cross between Black Eyed Marrowfat and Mummy, has yielded remarkably well throughout the east as well as the west. It would not be popular as a pea for soup on account of the black eye.

This (indicating sample) is a variety of oats called Columbian which is particularly suited to a pea and oats hay mixture.

The Chancellor is our earliest pea and, on an average for the past five years, has excelled the Arthur in yield of grain. We have great hopes for these two peas, Chancellor and Mackay.

By an Hon. Member:

Q. Have you not the Blue Pea?—A. Yes, we have some, but they do not yield up to these others.

By an Hon. Member:

Q. Has the Chancellor a long straw?—A. Yes.

By an Hon. Member:

Q. How does Chancellor do with a mixture of oats to grow to maturity?—A. It should be first rate.

By an Hon. Member:

Q. What is the ratio?—A. About one-half peck of Chancellor with two bushels of oats per acre, if the crop is to be harvested with the binder.

By an Hon. Member:

Q. Have they tested it in the west?—A. Yes.

By an Hon. Member:

Q. What proportion of Chancellor peas and of oats do you sow for hay production?—A. About 45 pounds of Chancellor to two bushels of oats to the acre. On the basis of our tests conducted so far, you would need to set your drill, as if you were sowing eight pecks of oats per acre.

By an Hon. Member:

Q. Do they feed regularly with the oats?—A. Yes. In the case of Arthur and Mackay, we recommend 60 pounds of Arthur or Mackay to two bushels of oats per acre when grown for hay. Strange to say, in sowing these mixtures, the size of the pea does not determine so much the way to set your drill as does the shape and size of the oats.

By an Hon. Member:

Q. Do they have to be treated?—A. No.

May I now refer briefly to the special efforts which are being put forth to meet the wheat rust situation which, at times, assumes enormously serious proportions, especially in western Canada. It is the general consensus of opinion at present that this situation may be met or alleviated by producing varieties which are capable of resisting the ravages of this pest. The proper testing of these varieties requires that facilities be provided whereby epidemic conditions may be produced artificially. To this end a special rust nursery and laboratory are being established in connection with the Agricultural College at Winnipeg and in co-operation with the Council for Scientific and Industrial Research. In this undertaking, the pathologists and plant breeders will work very closely together. This year, a large assortment of varieties and strains of spring wheat will be under preliminary test and it is hoped that the foundations may be well laid for a very thorough exploitation of this problem.

The Cereal Division has produced a number of interesting and promising varieties of barley of which two are worthy of special mention. One called *Duckbill*, a two-rowed strong strawed variety, and another called *Bearer* which is a six-rowed variety. The latter is a cross between a two-rowed and a six-rowed variety. *Bearer* is doing remarkably well. It is outyielding anything else we have tested at the Farms at Brandon and Indian Head. It is a little later than the ordinary variety of six-rowed, and the quality perhaps is not quite so good, but for feeding purposes, it seems entirely satisfactory. *Duckbill* is a very fine quality barley; it was this variety, produced at Ottawa, which won the world's prize at Chicago in 1923. We believe this will be a fine barley to mix with such varieties of oats as *Banner* and *Victory*, where one wants to grow mixed oats and barley for grinding for feeding cattle.

You are probably familiar with the hullless varieties of oats produced on the Farm at Ottawa, one called *Liberty* and one *Laurel*. The *Liberty* is a cross between *Chinese Naked* and *Swedish Select*, while *Laurel* is a cross between *Chinese Naked* and *Banner*. The *Liberty* in the far north is gaining a good deal of popularity, but unfortunately, in many places, it is very susceptible to smut, although this can be very easily treated by copper carbonate dust. It should not be treated with formalin because the germination may be very easily damaged by that treatment. Copper carbonate dust is a dust that can be purchased commercially. It is not suitable for treating the hulled varieties, but for these hullless varieties, it seems to be doing very well indeed. The *Liberty* is a strong strawed oat and also very early, two things which make it popular in the north. Some people find it very suitable for the feeding of chickens and young pigs on account of having a small percentage of fibre. Some people in the north country use it for porridge after soaking it over night. In a dry season, *Laurel* will produce quite a growth of foliage close to the ground, and it looks as though it might have a place as a pasture crop in a dry country.

By an Hon. Member:

Q. Do you think they are going to replace the old varieties of oats?—A. No, I would not think that. I think they may have a special place in such districts as I have mentioned, but they have not our ordinary oats in yield.

By an Hon. Member:

Q. Have you any outstanding new varieties of the old oats?—A. We have Longfellow which I spoke of and which looks at though it would be a good hay variety, and we have Prolific which is showing up very well indeed. We also have four or five other types, although we have not yet an oat excelling our Ottawa Banner 49, a selection made at the Central Farm out of the old Banner. Alaska is a variety of oats which is very early and which is very thin in the hull. It does not do very well in the west, in fact I do not know of any early oat that does very well in the west when sown in the ordinary way. It is possible that early maturing oats may be employed in some special way in cleaning the land.

By an Hon. Member:

Q. How is your Banner for earliness?—A. It matures about the same as ordinary Banner.

By an Hon. Member:

Q. Is it a heavier yielder than the ordinary Banner?—A. It yields more heavily than ordinary Banner.

By an Hon. Member:

Q. Are they suitable for the west?—A. Yes.

We are trying to crystallize our work as far as we can by having these good things grown in a large way. We co-operate with the Seed Growers' Association in this as we regard this organization as an excellent medium through which to have seed propagated. There are a large number of members of this Association scattered throughout the country who are taking these good things and endeavouring to keep them pure, so as to create sources of supply. On our own Experimental Farms we are doing everything we can to help these men in getting pure stocks of these varieties, when they wish to start in the growing of pure seed.

By an Hon. Member:

Q. Have you made any experiments with Bark's barley?—A. Yes. That variety yields well in many parts of Alberta particularly. It is a coarse barley, however, and the maltsters do not want it. It is a peculiar barley; sometimes it does very well indeed and other times you can hardly cut it, it grows so short. It is also late.

There seems to be a revival of interest in barley on the part of the maltsters. The Canada Malting Company uses large quantities for malting purposes and would use more if they could get barley of suitable quality and purity. They are trying to encourage the growing and the handling of barley for malting purposes.

By an Hon. Member:

Q. Where I live we have had to give over growing wheat altogether on account of rust and go into barley. We are getting crops of 50 bushels which makes it as good as wheat, and perhaps better.—A. In the malting process they have to have barley which will germinate evenly. Mixtures of different varieties will not do that.

By an Hon. Member:

Q. Apparently you are not paying as much attention to barley as to the other grains?—A. We speak more of wheat because we know that is what people in the west are particularly interested in, but we are not neglecting these other crops.

By an Hon. Member:

Q. Have you any barbless barley?—A. We are testing two or three kinds but so far have not produced any barbless type which is as good a yielder as are our common sorts.

By an Hon. Member:

Q. What about this barley in Prince Edward Island, Charlottetown No. 80?—A. Charlottetown No. 80, when it reaches maturity in the Maritime Provinces, will drop a large percentage of its awns. In the west, it does not do so any more than does our own Ottawa Duckbill. Our Duckbill will lose most of its awns in a strong wind.

By an Hon. Member:

Q. Referring to oats again for a moment, I have heard it argued that in planting oats for seed, it is not advisable to take out the small grain you find in the oats.—A. That is an argument we often hear, but actual experiments indicate that there is nothing really to it. There is usually the main oat and a small oat which we call the secondary. We recommend separating those for two reasons: first, these secondary oats will average about seven per cent thinner in the hull than the primary and are therefore more valuable for feeding. In the second place, if the season is not very satisfactory at sowing time, the smaller oat is not likely to give the plant the same start as the larger, plumper oat, so we always recommend grading the oats well to remove most of the secondaries.

By an Hon. Member:

Q. I did not hear you mention Abundance.—A. That is an oat that has done fairly well in some places, and not so well in others. It is gradually going back in the west or wherever we are testing it. We are not recommending it now. We are gradually eliminating in every possible way the less desirable varieties, so as to have as few as possible. When a man has a new variety to put on the market he now is required by the Seeds Act to secure a license from the Minister before he can sell it. These are referred to us for test. We have some pending now. We have had several cases referred to us when men have had things they claimed to be new, but when we investigated them, we found something to which they simply had attached a new name. Sometimes they are new.

By an Hon. Member:

Q. You mentioned the matter of greenhouses at Ottawa?—A. Yes.

Q. Is that the new vote that was passed in the estimates for greenhouses, or is that for the Horticultural Division?—A. I mentioned that we were hoping to have a greenhouse in the Cereal Division, to help along our work.

By Dr. Grisdale:

Q. That is not the same one.—A. In work as important as this we feel a greenhouse would be valuable. It would save much time.

Dr. GRISDALE: They will also have the use of the new one at Winnipeg.

Mr. SALES: In connection with the rust?

Dr. GRISDALE: Yes. We have ordered the greenhouse and equipment. The plans are now in the hands of the draughtsman. We prepared them as far as we could and they are now in the hands of the Public Works Department.

Mr. LOVIE: The building will go ahead?

Dr. GRISDALE: Yes.

Mr. HAMMELL: Provided the vote passes.

Dr. GRISDALE: It has passed.

By an Hon. Member:

Q. Mr. Newman, might I ask if there is any report on that new Renfrew wheat which has just been distributed?—A. Yes. That is the wheat formerly known as III, distributed from Alberta. It is a good looking wheat and we are including it in our tests, but I am afraid it is a little late for many districts. The Alberta people hope it may be a useful wheat in the southern parts of the Province.

Q. It promises to be a very heavy yielder?—A. Yes, but we have not tested it far enough yet to see exactly what it will do.

Q. I would like to ask you a question which is perhaps a general one. Would it be possible to carry on that experimentation work and develop these varieties without the facilities afforded by the Dominion Experimental Farm?—A. No. This sort of work is too slow and expensive to attract reliable private enterprise. Furthermore, it is important that all new productions be very thoroughly tested by people who are not financially interested in them; otherwise, the country would likely soon be overrun with all sorts of varieties for which extravagant claims would be made.

Mr. SALES: I would move a hearty vote of thanks to Mr. Newman for his services this morning in giving us this very interesting and illuminating address.

SEVERAL HON. MEMBERS: Second the motion.

The motion was agreed to.

Mr. NEWMAN: I hope you gentlemen may find time to come out and see our movie. It was put on last year but there was a very small attendance. Those who did see it liked it so well that they recommended it to be put on at Wembley, so that we had a duplicate made for that purpose and we have been told it was the best immigration picture they had.

Mr. SALES: When will that picture be shown?

The CHAIRMAN: Tuesday evening at 8.30 in the Railway Committee room.

Mr. STEWART (Humboldt): There has been a stenographic report made of Mr. Newman's address this morning. Is it the intention to have this printed and available for distribution? I might say that last year I was one of the few who heard Mr. Newman, and because I was impressed with the work that he told us about, I mentioned it to a number of wheat farmers in my own constituency and I found they were extremely interested, and I have had correspondence from a number of them and it seems to me perhaps that a greater part of the value of this address will be lost if it should have to be disseminated only by word of mouth by the members of this Committee who have heard Mr. Newman.

By the Chairman:

Q. Is the substance of most of this matter printed in any way, Mr. Newman?—A. In a general way. But we have not made the statements in print that I have made here this morning, regarding this new wheat for instance.

Mr. SALES: You would be flooded with applications if it were made public.

The WITNESS: I suppose we would.

By Mr. Sales:

Q. Have you ever thought, Mr. Newman, of going up and attending the Saskatchewan Agricultural Society's Convention with your moving picture on plant breeding, and giving an address there?—A. Yes, I would be glad to do that.

Mr. SALES: There you would meet the delegates of the Agricultural Societies who would go back and make their reports.

The WITNESS: We had that sort of thing in mind when we prepared the movie, that is, to give the people a chance quickly to get a bird's-eye view of what we are trying to do.

Mr. STEWART (Humboldt): What about the question I asked?

The CHAIRMAN: It is usually a matter of moving to make a recommendation to the House. If the Committee wishes to have this printed and instructs me to make a recommendation to the House, I will do it.

Mr. STEWART (Humboldt): I will so move.

Mr. SINCLAIR (Oxford): Second the motion.

Mr. McMASTER: There was the inference given that perhaps Mr. Newman was not quite ready to have this go out broadcast.

The WITNESS: I think what I have said to-day can go out. I have qualified the statements I have made, in all cases.

The CHAIRMAN: Moved by Mr. Stewart (Humboldt), seconded by Mr. Sinclair (Oxford) that a recommendation be made to the House that the address this morning be printed.

Mr. SALES: After Mr. Newman has had a chance to edit it?

The CHAIRMAN: Yes, I will send a typewritten copy to Mr. Newman and ask him to read it.

Motion agreed to.

The witness retired.

The Committee adjourned.

Mr. Storer: You would be obliged with applications if it were made public.
The Director: I suppose we would.

By Mr. Storer:

Q Have you ever thought Mr. Newman of young up and standing the
Saskatchewan Agricultural Society's Convention with your making plans on
plant breeding and giving an address there?—A Yes, I would be glad to do that.

Mr. Storer: Then you would meet the delegates of the Agricultural Societies
who would go back and make their reports.

The Witness: We had that sort of thing in mind when we prepared the
report, that is to give the people a chance quickly to get a bird's-eye view of
what we are trying to do.

Mr. Storer (Humboldt): What about the question I asked?

The Chairman: It is usually a matter of moving to make a recommendation
to the House. If the Committee wishes to have the printed and instruct me to
make a recommendation to the House, I will do it.

Mr. Storer (Humboldt): I will so move.

Mr. Storer (Oxford): Second the motion.

Mr. McManis: There was the inference given that perhaps Mr. Newman
was not quite ready to have the report broadcast.

The Witness: I think what I have said today is correct. I have qualified
the statements I have made in all cases.

The Chairman: Moved by Mr. Storer (Humboldt) resolved by Mr.
Storer (Oxford) that a recommendation be made to the House that the address
be printed.

Mr. Storer: After Mr. Newman finished his remarks edit his copy.

The Chairman: Yes, I will send a typewritten copy to Mr. Newman and

ask him to read it to you and the Committee.

Motion agreed to, vote 10 yeas and 10 nays.

The witness retired, accompanied by the Clerk.

The Committee adjourned.

Adjourned until tomorrow.

Adjourned until tomorrow.

Adjourned until tomorrow.

Adjourned until tomorrow.

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