

# THE ADMINISTRATION OF BOVINE TUBERCULOSIS ERADICATION IN CANADA<sup>1</sup>

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*Canada's campaign against bovine tuberculosis has met with marked success. Based on nationwide tuberculin testing, elimination of infected animals, and compensation of owners, it has greatly reduced the extent of the disease.*

## Introduction

Canada's program to eliminate tuberculosis from its livestock has met with great success. Administration of the program has at times presented difficulties, but these were of minor significance in terms of the overall results. Today we only uncover tuberculosis in Canadian cattle on rare occasions, even though the level of infection in some parts of Canada was once as high as 25 per cent.

The first Canadian testing of bovine livestock for tuberculosis dates back to 1897, when tuberculosis testing was offered to livestock owners free of charge on a request basis. There were no restrictions on disposal of reactors, nor were these reactors identified. Soon after, in 1905, the Supervised Herd Plan was introduced. Although this program was also voluntary, reactors were identified and had to be removed from the herd.

In 1907 a national meat inspection system was introduced into Canada, via legislation known today as the Meat Inspection Act. This system produced reliable statistics on the incidence of tuberculosis in animals slaughtered under inspection. This, in turn, provided the impetus for development of programs aimed at control and eradication of the disease.

The next phase in the history of our program began in 1914 with passage of the

Municipal Tuberculosis Order. This was prompted by the existing rate of human tuberculosis and the fact that bovine tuberculosis could be transmitted to man through milk. Under this Order, a municipality could pass by-laws assuring that its supply of milk came from herds free from tuberculosis. The plan provided, for the first time, that the Department of Agriculture would pay compensation to livestock owners for sacrificing tuberculosis reactors.

In 1919 the Accredited Herd Plan was introduced to provide a source of purebred tuberculosis-negative breeding animals, particularly bulls. This voluntary herd plan, designed primarily for purebred herds, is still in effect today.

## Conducting a Nationwide Campaign

Around this time it became apparent that control and eradication of bovine tuberculosis would require expanding the program—first to include all herds in a large geographic area and eventually to cover the entire country. As a result, the Restricted Area Plan Regulations came into effect. These provided for compulsory testing of all cattle in every county, district, or municipality designated by an Order in Council as a restricted area. The first testing of this sort was conducted in 1923 in an area of Western Canada.

This nationwide attack on tuberculosis was assisted by our veterinary organization with its headquarters in Ottawa. The country is divided

<sup>1</sup>Paper presented at the V Inter-American Meeting on Foot-and-Mouth Disease and Zoonoses Control held in Mexico City on 10-13 April 1972.

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into seven districts with a district veterinarian in charge of each one. All of them are broken down into subdistricts, which are assigned a staff and a veterinary officer-in-charge. There are 135 subdistricts and each has approximately 100,000 cattle. The subdistrict staff visits farms to carry out the tuberculin test and related tasks; this procedure has proven efficient in eliminating not only tuberculosis but also other diseases.

The basis for eradication under the Area Plan was the intradermal tuberculin test; but since it was known that some heavily infected animals did not always react to the test, provision was made for the veterinarian to carry out a careful physical examination of the herd. The veterinarian would then remove as reactors any animals showing clinical evidence of the disease and any animal with an enlarged lymph node. In a herd where there was a high percentage of infection, the entire herd was slaughtered.

In the early days of tuberculosis testing, an average of one reactor was revealed for every 33 cattle tested. In addition, federally inspected slaughtering plants condemned an average of one carcass in 125.

Animals ordered slaughtered on account of tuberculosis were permanently marked and licensed for slaughter at a packing plant operating under the Federal Meat Inspection System. Owners were encouraged to visit the packing plant when their reactors were slaughtered, so as to be present when a veterinary postmortem was conducted and see actual tuberculosis lesions. The need to remove reactors was thus impressed upon the owners, who often informed their neighbors of the postmortem lesions.

Under the Area Program, the Department of Agriculture has always paid compensation to owners for removal of reactor cattle; this is an important part of any disease eradication program. On the other hand, having reactors must not be made profitable. For this reason, compensation was not set at full market value, but rather was intended to assist the owner in purchasing replacement animals. Besides this

compensation, the owner received the meat value of the carcass from the packing plant. If the carcass was condemned as unfit for food, the Department paid for the carcass.

Following reactor removal, the owner was required to thoroughly clean and disinfect his premises; compensation was not paid until this work had been satisfactorily completed. Retests were conducted on the herd at periodic intervals of not less than sixty days. Once all cattle in an area were tested, the region was given accredited area status for a period of three years—provided the rate infection was not more than 0.5 per cent. If the rate was less than 0.2 per cent, the area was accredited for a six-year period. Provision has now been made to extend this six-year accreditation an additional three years, so long as there is no indication that tuberculosis is on the rise.

In June 1961 a ceremony in a northern part of Western Canada marked completion of the first general test of all cattle in all areas of the country. Overall, during the history of the program 50,000,000 tuberculin tests were performed, 400,000 reactors were ordered slaughtered, and roughly \$15,000,000 (Canadian) was paid in compensation to livestock owners. The peak year was 1949, when 2,000,000 tests were conducted and 30,500 reactors were slaughtered.

### Use of the Tuberculin Test

As is well known, Robert Koch first identified a type of acidfast bacteria in 1882 which was shown to be the cause of tuberculosis. Then in 1890 he developed the diagnostic agent—tuberculin—which is essentially the same diagnostic agent being used today in our National Bovine Tuberculosis Eradication Program.

From the beginning, we have relied on Koch's Old Tuberculin, using *Mycobacterium tuberculosis bovis*, Strain 110. This culture is now grown on synthetic media, killed by heat, and separated by centrifugation; the remaining fluid is then concentrated down to 10 per cent of the culture's original volume. The tuberculin

TABLE 1—History of Canada's bovine tuberculosis eradication program.

Years (1 April to 31 March)	Cattle tested	Reactors		Compensation paid (Canadian \$)
		No.	% of total	
1922-1930	1,753,517	65,005	3.70	2,213,829.81
1930-1939	5,622,709	141,080	2.50	4,172,164.33
1939-1949	8,388,425	114,312	1.36	3,853,081.88
1949-1959	17,585,927	80,879	0.45	3,887,568.81
1959-1969	8,738,234	9,999	0.11	726,909.84
1969-1970	412,603	425	0.10	54,483.03
1970-1971	461,645	516	0.11	59,122.17

used in the program has always been made at the Department of Agriculture's central laboratory.

Over time, the Canadian eradication program has demonstrated the reliability of the intradermal tuberculin test. However, the need to properly apply and interpret this test must be emphasized. There has been some controversy over the site of injection of tuberculin, but in Canada we have relied on the caudal fold. It is recognized that this site is less sensitive than the cervical area, but it is also more specific.

In addition, injection of the tuberculin into the caudal fold is recommended for economic reasons. As the test can be applied with a minimum of restraint, more animals can be tested in one day by using the caudal fold than by using any other injection site. It is also easier to interpret caudal fold tests through manual examination than it is to interpret tests at other sites.

On retesting infected herds, supplemental tests may be used as an adjunct to the intradermal test in the caudal fold. As a supplementary test, we prefer the ophthalmic (involving instillation of tuberculin into the eye), having found it helpful in retesting infected herds and also in retesting animals which give a suspicious reaction to the caudal fold injection.

When tuberculosis is discovered in a herd of cattle, complete epidemiologic studies must be carried out. Through these studies, the source

of infection must be determined and, in problem herds, all animals on the premises—including dogs and cats, as well as humans—must be checked for tuberculosis. Sales of cattle from an infected herd have to be traced and the animals sold must be tested.

#### Limiting Swine and Poultry Infection

Steps have also been taken in Canada to reduce tuberculosis infection of swine and poultry. When swine are found to be infected with tuberculosis at the time of slaughter and are condemned, each carcass is traced to its herd of origin and an investigation is conducted. In Canada, every pig sold must be marked prior to slaughter and identified as to its owner. This procedure makes it relatively easy to find the herd of origin.

When the original herd of an infected pig is investigated, cattle on the premises are given a tuberculin test and any poultry present are also examined. The latter examination usually indicates that infected poultry have spread tuberculosis to the swine. (No tuberculin test is used on either swine or poultry because of its unreliability.) Owners are instructed about how to eliminate tuberculosis from their swine and poultry and how to clean and disinfect the premises. Emphasis is placed on the danger of permitting swine to eat dead poultry.

When extensive tuberculosis is discovered in slaughtered poultry, the birds are traced to the

flock of origin and an investigation is carried out, with advice and guidance being given to the owner. The Government does not order the slaughter of either swine or poultry for tuberculosis, but its program of educating owners about tuberculosis in swine and poultry has played a key role in reducing infection.

### Current Detection Efforts

During the last decade, emphasis has also been placed on tracing infected cattle to their herds of origin when tuberculosis lesions were revealed in the course of regular slaughter. This procedure has been most rewarding as a way of finding the last vestiges of tuberculosis in Canadian cattle.

However, the cost of farm-by-farm testing has been found excessive in recent years, as the level of infection in Canada is now minimal. Moreover, there is now a shortage of help on farms, making it difficult for an owner to assemble his cattle and provide assistance in conducting a herd test.

It was therefore necessary to develop new disease control concepts, and to introduce a screening program for both tuberculosis and brucellosis. This program can be compared with the random sampling procedures used in industry to pick out defective or imperfect units coming off an assembly line. This Market Cattle Testing Program has been in effect in Canada since 1961.

Under the Market Cattle Testing Program, plastic-type backtags are applied with a special cement behind the shoulder of cattle marked for slaughter. These coded backtags identify the subdistrict of origin; each tag is also numbered. For identification purposes, the number on the tag is recorded, along with the name and address of the animal's owner. The tags are applied at ranches, stockyards, livestock markets, and other assembly points.

Postmortems are conducted on all carcasses in slaughterhouses under national inspection. If a back-tagged animal shows no tubercular lesions, credit is given to the herd of origin; cases

with lesions are of course traced to the herd of origin, where a special test is conducted. A card file is then maintained for each owner which records the results of the postmortem examinations. With this arrangement, it has been found unnecessary to do a tuberculin test on farms showing negative postmortem results for 30 per cent of the entire herd over a six-year period.

Cattle owners are pleased with the Market Cattle Testing Program and we are receiving good cooperation. This is due both to our effective publicity campaign and to owners finding that they can avoid a herd test if sufficient postmortem credits have been given to their herd. This has reduced on-the-farm testing by roughly 75 per cent. All in all, the program has proved to be most successful.

### Conclusions

Eradicating tuberculosis in livestock presents a number of difficulties, but these can be overcome by any country, provided all details of a sound program are adhered to. Canada now condemns only one carcass for every 33,000 animals slaughtered, the prevalence of infection is now 0.06 per cent, and 75 per cent of our reactors show no visible lesions when slaughtered.

It is estimated that the Bovine Tuberculosis Eradication Program has saved the Canadian cattle industry \$10,000,000 (Canadian) per year, considering all factors involved. There has also been a considerable saving for our swine and poultry industry. In addition, Canada's greatly reduced level of bovine tuberculosis is no longer producing infection in humans.

Overall, Canada's livestock population is recognized as being one of the healthiest in the world. The National Eradication Program for Tuberculosis has in no small way contributed to this reputation. Still, it is recognized that the disease has not been completely eradicated, and that continued vigilance will be needed to achieve the goal of total eradication. We are confident, however, that this goal can be attained.

### SUMMARY

Canada's nationwide campaign against bovine tuberculosis has greatly reduced the disease as a major health problem. When tuberculin testing began on a large scale in the 1920's, roughly one of every 33 cattle tested was shown to be infected. This contrasts markedly with the modern ratio of about one infected animal for every 900 tested. In fact, the level of infection is now so low that general farm-by-farm testing has lost much of its economic justification and has been partly replaced by other methods.

The basis for this highly successful program was identification of reactors through mass tuberculin testing, elimination of infected animals, and compensation of owners for their lost stock. As of June 1961, 50,000,000 tests had been performed, orders had been given to

slaughter 400,000 reactors, and owners had received roughly \$15,000,000 (Canadian) as compensation.

Today all cattle sold are tagged, and a limited number of tubercular lesions are found at the slaughterhouse. Infected carcasses are traced to their herds of origin, where extensive tests are conducted. However, owners get credits for uninfected carcasses, and sufficient credits enable them to forego farm tests.

Steps are also being taken to reduce infection of swine and poultry. Like cattle, commercial swine are marked before slaughter. Infected carcasses are then traced to their farms of origin, where cattle receive a tuberculin test and swine and poultry are examined for disease.

### MEASLES IN THE UNITED STATES

In the first four weeks of 1973, 2,107 cases of measles were reported to the United States Center for Disease Control. This represented a decrease of 12.2 per cent from the comparable period in 1972. However, 13 states and Puerto Rico showed an increase in the number of cases reported compared with the same period last year. The New England region accounted for 40.2 per cent of the 2,107 cases reported, with Massachusetts having 21.0 per cent, Connecticut 11.3 per cent, New Hampshire 5.9 per cent, Rhode Island 1.2 per cent, Vermont 0.7 per cent, and Maine less than 0.1 per cent.

Recently investigated outbreaks continue to demonstrate that the large number of reported measles cases have resulted from pools of susceptible children. Epidemiologic investigations have documented vaccine efficacies of over 90 per cent; vaccine failures have been attributed primarily to unsuccessful vaccination. [*Morbidity and Mortality Weekly Report*, Center for Disease Control, Atlanta, Georgia, Vol. 22, No. 5, February 1973.]