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## *Special Service Article*

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### TUBERCULOSIS AND BRUCELLOSIS AS MILK BORNE DISEASES

**Editor's Note:** Presented herewith is a Special Service Article on Tuberculosis and Brucellosis. Sometimes complacency may exist with regard to these two diseases, transmissible to man. While real progress has been and is being made, this Article indicates the need for constant vigilance. Also presented is a review of the situation as it now stands.

It is a tragic paradox that milk as one of the most important foods in the diet of the American people, is also an important vehicle for the transmission of disease of both human and animal origin. Bovine tuberculosis and brucellosis are probably the two most commonly known animal diseases which are transmitted to humans through the consumption of milk. Both can be completely eliminated in humans only by total eradication of the disease in animals.

#### TUBERCULOSIS

Tuberculosis is pathogenic to many animals, including mammals, birds, fish and reptiles, yet the only animals from which the disease is transmitted to humans are cattle and goats. (1) During the past 40 years, tremendous progress has been made in this country in reduction of tuberculosis in cattle through Federal and State test and slaughter programs. The nationwide incidence has been reduced from a high in 1918 of nearly 5 per cent of the animals and 25 to 50 per cent of the herds tested, to a low in 1952 of 0.11 per cent of the cattle tested. In 1940, the entire nation attained modified accredited status (infection rate of less than 0.5 per cent.) (2)

Unfortunately, after reaching modified accredited

status, it became more difficult to obtain support for tuberculosis eradication programs, and, of course, during World War II, our fiscal and manpower attention and resources were diverted to the war effort. As a result of cutbacks in tuberculosis testing programs, the incidence of reactors in some States has increased since the war and this trend is expected to continue in certain areas until more intensified testing programs are instituted. In one of the States, the infection rate in cattle tested, rose from a low of 0.18 per cent during the war years to a high of 0.87 per cent in 1956. The average rate of infection in cattle tested in one county in this State rose as high as 5.14 per cent. To correct this condition the State, in cooperation with the U. S. Department of Agriculture, is now testing all cattle in each county as it comes due for accreditation. The State officials are also obtaining information on pretest movement of animals in and out of infected herds as a means of locating and eliminating other possible foci of infection, and tracing back to the herd of origin untested cattle that are slaughtered and show evidence of tuberculosis. Other states are similarly adopting more stringent programs in an effort to reduce infection where the infection rates have indicated that a problem was developing and to eliminate the disease entirely where the infection rate is low. The problem of eliminating the residual foci of infection will be particularly difficult, because of the lack of a rapid and practical method of screening herds for infection, short of periodic testing of all animals in all herds.

#### MILK BORNE BOVINE TUBERCULOSIS

At this point we might ask the question, is milkborne bovine tuberculosis in this country a serious public health problem? Only isolated cases of this disease

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in humans have been reported during the past few years. Two examples come to mind. In 1954, a farm boy in Michigan was found to have bovine tuberculosis. Upon testing the cattle on the farm, all 17 were found to be reactors and 15 showed gross lesions when slaughtered. In 1948, there was a fairly large outbreak in Ohio which involved 119 school children who consumed raw milk. Dr. Robert Anderson, Chief, Communicable Disease Center,<sup>(1)</sup> pointed out that although current medical literature contains statements that the role of bovine type tuberculosis is an insignificant one in this country, data is not available to support such statements. He went on to say that, "*The public health importance of animal tuberculosis, it seems to me, cannot be measured with the information we now have. We think bovine tuberculosis in humans is rare. The cases that have come to the attention of the Communicable Disease Center since 1950 — cases confirmed by laboratory study — can be counted on the fingers of one hand. But this communicable disease, that exists in animal hosts closely associated with man, does not announce itself in sudden, dramatic onset, but often develops slowly and can go unrecognized for long periods. Its public health importance must be evaluated by some means more definite than opinion.*"

#### PUBLIC HEALTH CONTROL

In view of the increasing incidence of tuberculosis infection in dairy cattle and in view of the potential hazard of the transmission of the infection to humans through milk consumption, what public health controls are necessary? How can the chain of infection be broken? First and foremost in the prevention of any milkborne disease, is the mandatory pasteurization of all milk. Those states, cities and counties who do not, as yet, have laws or regulations requiring the pasteurization of all market milk and milk products, should certainly pass such regulations without delay. In addition, broad educational campaigns should be conducted by the state or county health departments, directed to the rural population who may consume raw milk from their own cow or dairy herd, or from that of a rural distributor. These public education programs should underscore and reiterate the necessity to either boil or pasteurize such milk before consumption, or use only commercially pasteurized milk. Secondly, it is important that health officials cooperate with livestock disease control officials in the establishment and conduct of effective programs for the eradication of bovine tuberculosis.

#### MILK ORDINANCE AND CODE PROVISIONS

The Milk Ordinance and Code—1953 Recommendations of the Public Health Service, which provides

the basis for milk sanitation regulations in 34 States, 2 Territories, 477 counties and 1,398 municipalities, contains safeguards to prevent transmission of tuberculosis through milk and milk products. Section 7, Item 1r, *Cows - Health*, requires that all milk for pasteurization shall be from herds which are tuberculosis free, or from herds which are located in modified accredited free areas and which have been tested for tuberculosis not more than 6 years prior to the adoption of the Ordinance and at least once every 6 years after such test. All additions to the herds are required to be free from tuberculosis. Tests, retests and disposal of reactors are required to be made in accordance with current USDA requirements. A certificate identifying each animal in a herd is required to be on file as evidence of the tests or retests.

There is currently some question as to whether the tuberculosis provisions of the Ordinance should be revised. Three changes have been proposed by various groups, namely: (1) permit animals from herds located in modified areas to be added to the dairy herd without another test, (2) eliminate the provision which requires test of herds at least once every 6 years and (3) eliminate the requirement that all animals tested be identified. The experience of some states would indicate that testing more frequently than once every 6 years (as required by some states and municipalities) is indicated.

Section 8 of the Ordinance, *Grades of Milk and Milk Products Which may be Sold*, specifies that all milk and milk products for human consumption must be pasteurized. Although pasteurization is a very important and effective safeguard against the transmission of tuberculosis in milk, it is subject to mechanical failure and human errors, consequently, the most effective measure is to completely eradicate the disease from our animal population. Seven states now require pasteurization of all market milk. And in the U. S., currently, ninety-five per cent of market milk is pasteurized.

#### BRUCELLOSIS

Although brucellosis is primarily an occupational disease, it is transmitted to man through the consumption of raw milk and dairy products from infected animals. Fortunately, since World War II, there has been a gradual decline in the number of cases of human brucellosis reported throughout the country. During the 10-year period 1947-1956, the States reported to the National Office of Vital Statistics, a total of 31,132 cases of brucellosis. A high of 6,321 cases in 1947 decreased gradually to 1,100 cases in 1956. Results of studies in Iowa, Minnesota and Wisconsin and other states have shown a correlation between the incidence of brucellosis in humans and in

different species of animals. A number of state health department officials and medical investigators were invited recently by the Communicable Disease Center to submit their evaluation of brucellosis as a public health problem. A consensus of their views as to the source of human infection was as follows:

Farm Occupational	40%
Raw Milk or Cream	20%
Industry Occupational	20%
Unknown	20%

Reporting on specific epidemiological case-histories by the various state health departments showed that 61 out of a total of 381 cases of brucellosis in humans were attributed to the consumption of infected raw milk.

### THREE SPECIES INFECT

Brucellosis in humans and animals is due to infection with any of three species of *Brucella*, namely *abortus*, *suis* and *melitensis*. Even though *abortus* is the species most commonly found in cattle, all three may be transmitted through milk. Borts, and others, reported on a milkborne epidemic in Iowa in which 77 cases of human brucellosis was caused by *Brucella suis*. The milk involved in this outbreak came from a herd of 24 cows in which 11 reacted to the blood agglutination test. The organism was isolated from the milk.

There is no known cure for brucellosis in animals, therefore, the only effective means of eliminating the disease in dairy cattle is by vaccination of all calves, and test of all adult animals followed by slaughter of the reactors. Reinfection is prevented by bringing only brucellosis-free animals into the herd. Eradication of brucellosis from beef cattle and swine on the premises and adjoining premises must be done also.

### PROGRESS MADE

A great deal of progress has been made in eliminating brucellosis in cattle through the cooperative State-Federal brucellosis eradication program. In recent years this progress has been particularly rapid due to a combination of factors, the most significant of which are (1) the passage of State and local milk regulations requiring brucellosis-free herds for the production of market milk, (2) the introduction of the rapid and economical milk ring and whey tests for screening herds for infection and (3) extensive calf vaccination which is resulting in higher herd immunities.

According to USDA reports the rate of infection for the nation as a whole is declining very rapidly. In spite of an increased concentration of blood testing on BRT suspicious herds, there is still disclosed a significant reduction in percentages for blood reactor cattle and herds. The infection rate for herds tested is now down to about 10 per cent, and for cattle

tested is down to 0.16 per cent. The number of States which are attaining certified status is also increasing. Currently, there are 9 states (Conn., Del., Mo., Minn., N. H., N. C., Vt., Wash., and Wisc.) and one territory (Puerto Rico)\* which are modified certified brucellosis free. This means that they have less than one per cent infection in the cattle and 5 per cent of the herds. In addition, 441 counties in 27 other states have attained this status. The USDA predicts that at the present rate of eradication, over one-half of the states will be Modified Certified Brucellosis free by 1960.

### UNIVERSAL PASTEURIZATION NEEDED

The same public health controls as mentioned above for tuberculosis are equally applicable for preventing the transmission of brucellosis to humans through the consumption of infected milk. Pasteurization or boiling of milk before consumption is a vitally important safeguard and, of course, eradication of the infection in milk producing animals will result in elimination of the disease in humans.

### PLAN A AND B

Section 7, Item 1r, of the Milk Ordinance and Code requires that within (from 1 to 5) years after adoption of the Ordinance, all milk and milk products for pasteurization shall be from herds certified by the State livestock disease control authority as following either plan A or plan B approved by the USDA for the eradication of brucellosis. All additions to the herds must be brucellosis-free. A certificate identifying each animal shall be evidence of the above test, and it shall be filed as directed by the health officer. Plan A requires test and prompt slaughter of all reactor animals, and permits vaccination of calves. Plan B permits retention of reactor animals in the herd. Plan B, of course, is not consistent with the definition for milk which specifies that milk is the, *lacteal secretion . . . obtained by the complete milking on one or more healthy cows . . .* However, at the time this Ordinance was written the incidence of brucellosis in dairy herds was much higher than it is now largely because health departments had not given sufficient attention to the eradication of this disease from dairy herds. To have required dairy herds to be brucellosis-free would have created a severe milk shortage and an economic crisis in some areas. Therefore, it was agreed that for milk which is to be pasteurized it should be permissible to retain the reactor animals in the herd. In this connection, the Code states that, *Ultimately, this ordinance will be revised to require*

\* As of May 1959, the following additions should be made: Maryland, Michigan, Nevada, New Mexico, Pennsylvania, Rhode Island, Utah.

all milk-producing herds to be under Plan A; therefore, a dairyman who has brucellosis reactors in his herd is urged to eliminate a sufficient number of such reactors each year so that all reactors will have been removed from the herd within a period of 3 years after his entry into Plan B. A longer period of time may be needed in isolated instances where the incidence of brucellosis in the herd is higher than 50 per cent." The stimulus resulting from more stringent requirements in state and local milk laws and regulations with respect to brucellosis has been much more pronounced than was anticipated. Many states and municipalities already require herds to be free from brucellosis, or have established dates when all of the herds must be brucellosis-free. Livestock disease control officials and the industry are very much pleased with the progress being made and realize that everyone is profiting by the elimination of brucellosis.

#### PROPOSED REVISIONS

Proposals are currently under consideration for revision of the brucellosis provisions of the Ordinance. These proposals are as follows:

1. Require all dairy herds to be brucellosis-free or be located in a certified area.
2. Require all additions to the herd to be brucellosis-free or from herds located in certified areas.

3. Not require identification of each animal.

4. Discuss the utilization of the milk ring test as an effective screening test for the location of foci of infection.

In conclusion it should be reemphasized that bovine tuberculosis and brucellosis, the two most commonly known animal diseases transmitted to humans through the consumption of milk, CAN be completely eliminated in humans only by total eradication of the disease in animals. Although pasteurization is a very effective safeguard in preventing the transmission of disease through milk, our goal should be the total elimination of the source of infection.

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