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Mastitis
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C. S. BRYAN

MICHIGAN STATE COLLEGE

Of Agriculture and Applied Science

EXTENSION DIVISION

R. J. Baldwin, Director

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MASTITIS

C. S. BRYAN
BACTERIOLOGY DEPARTMENT

A dairy cow is only as good as her udder; therefore, any intermittent or permanent alteration of the milk or udder is not conducive to profitable milk production. The following discussion may help the dairyman better to understand the diagnosis, prevention, and control of streptococcic mastitis.

Mastitis is an inflammation of the udder, one result of which may be the production of abnormal milk. The disease may be acute or chronic in nature, as determined by the physical condition of the cow and the type of milk produced. Frequently the chronic type may "flare up" and assume an acute form that may terminate fatally. A physical examination of the milk does not always indicate the abnormality for not all affected cows produce abnormal milk and, conversely, not all animals giving abnormal milk have mastitis. On this account, both a laboratory examination of the milk and a physical examination of the cow by a veterinarian are essential for proper diagnosis.

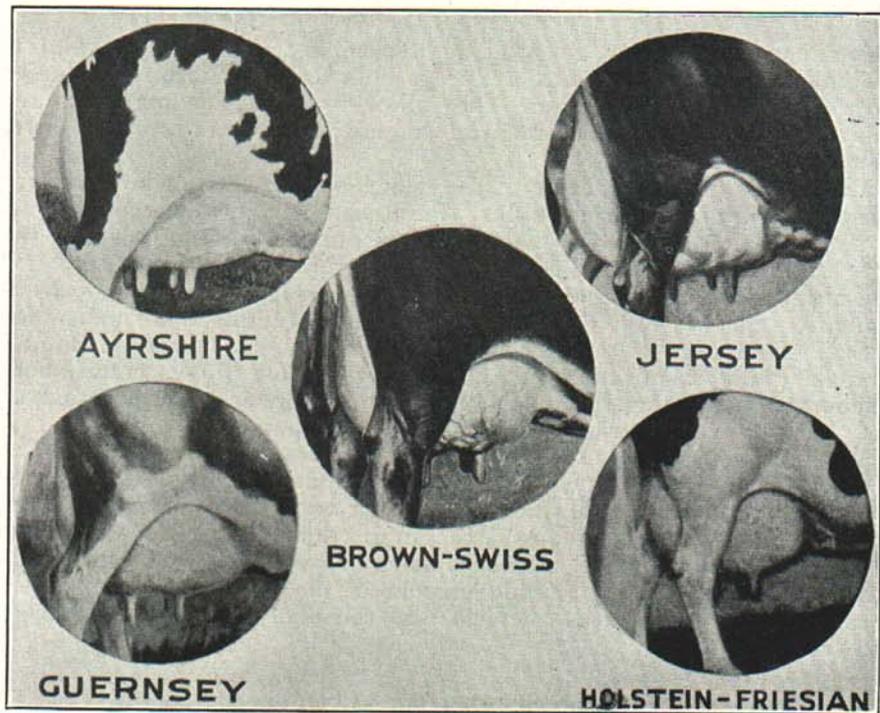
Non-infectious agents such as bruises, injuries of the udder or teats, and chilling may cause mastitis. The inflammation, however, may subside and the character of the milk return to normal as soon as the local condition is corrected and the injury heals. The non-infectious mastitis, therefore, does not become a herd problem except when streptococcic mastitis is already present in the herd. The injury then permits easy entry of the bacteria into the udder, resulting in streptococcic mastitis.

STREPTOCOCCI OF MASTITIS

The mastitis problem that confronts the average dairy farmer is presented by infectious mastitis. The streptococcus group of bacteria is responsible for about 99½ per cent of the infectious mastitis. This group includes many varieties of streptococci—the bacteria brought into the herd by human beings with sore throats or open sores on their hands, by infected cows recently purchased, and the kinds of bacteria already infecting the herd. The streptococci probably get into the udder through the teat opening or injuries of the udder or teats. Irrespective of whether the streptococci are of human or animal origin, they are capable of producing the same physical and chemical changes in the milk and the same pathological changes in the udder. All cows eliminating the streptococci in their milk must be considered as being infected if a program of prevention and control of mastitis is to be carried out. At first very little alteration is noted in the milk or

udder, but later definite evidence of changes is encountered. During this time there is practically continuous elimination of the streptococci in the milk.

It has been found that streptococci remain alive for 66 days in air dry sand, 10 days in air dry soil, 8 days in burlap sacking, and 65 days in water. Living streptococci of mastitis were found in barns that had housed infected cows, for a period of 30 days after the infected cows had been removed from the herd. This emphasizes the need of sanitary procedures in handling the dairy herd.



Photo—Courtesy Dr. C. W. Turner, University of Missouri.

Fig. 1. This illustrates the udders idealized by the various breed associations. It is evident that each breed has its own specific type of udder but, in general all are of good size, symmetrical or balanced, have squarely placed teats of medium size, with the udder well attached below and in the rear. These characteristics indicate the conformation of the ideal udder and should serve as a guide in the selection of cows for dairy purposes.

THE UDDER AND MILK

The normal udder should be symmetrical or balanced; any variation from this is suggestive of mastitis. The streptococcus infection results in a replacement of the secreting tissue with scar tissue. The milk production of such cows is greatly reduced and may result in one or more quarters "going blind". During acute stages of the disease

the udder or part of it may be swollen, feverish, and the milk may be abnormal in appearance.

The diagnosis of mastitis by physical examination is based upon the condition of the milk and changes in the udder. It is important properly to interpret the changes found in the udder, and therefore essential that a qualified veterinarian make the necessary physical examination.

The teats of a heifer prior to freshening or being sucked before freshening, are well-sealed. This seal and the uninjured tissue keep the streptococci of mastitis from gaining entrance into the udder. Thus,

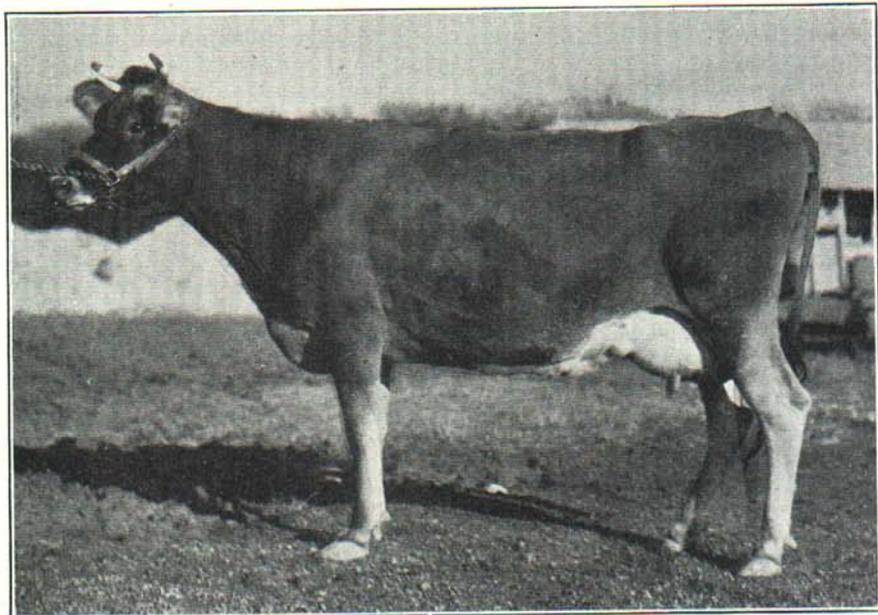


Fig. 2. It is not necessary that a dairy cow have an udder that measures up to the ideal for the breed to be classed as normal. The above cow has a good normal udder. It is possible to find many udders like this one, and for profitable milk production it is advisable that the cows have normal udders. In addition, notice should be made that the good physical condition of this cow is indicative of her general appearance as a comparison will be made with cows in the advanced stages of mastitis.

insofar as streptococcic mastitis is concerned heifers that have not freshened or not been sucked or injured on the udder or teats are safe animals to buy or raise as replacement cows.

Some of the signs in the milk that suggest mastitis are: Flakes and pus that clog the filter pad when straining or produce an excessive amount of separator slime if the milk is run through a separator; an indefinite cream line separating gravity cream and skimmilk, and a bloody or watery milk. In the early stages of the infection, the milk is usually normal in appearance, but at this time a laboratory examination will reveal the presence of streptococcus infection. The affected

milk is of inferior quality, thus emphasizing the need of streptococcic mastitis-free herds if high quality milk is to be produced.

STREPTOCOCCIC MASTITIS IS A MAJOR DAIRY PROBLEM

All evidence points to this being a major dairy problem from both the economic and hygienic standpoints.

1. Shaw and Beam of the Pennsylvania Agricultural Experiment Station, have reported that quarters infected with streptococci produce 22 per cent less butterfat than the streptococcus-free quarters. Since many cows are infected in all four quarters a similar decrease in milk and butterfat production may be expected and has been observed. This makes it necessary to maintain an excessive number of cows to furnish a given amount of milk. Such a procedure becomes expensive

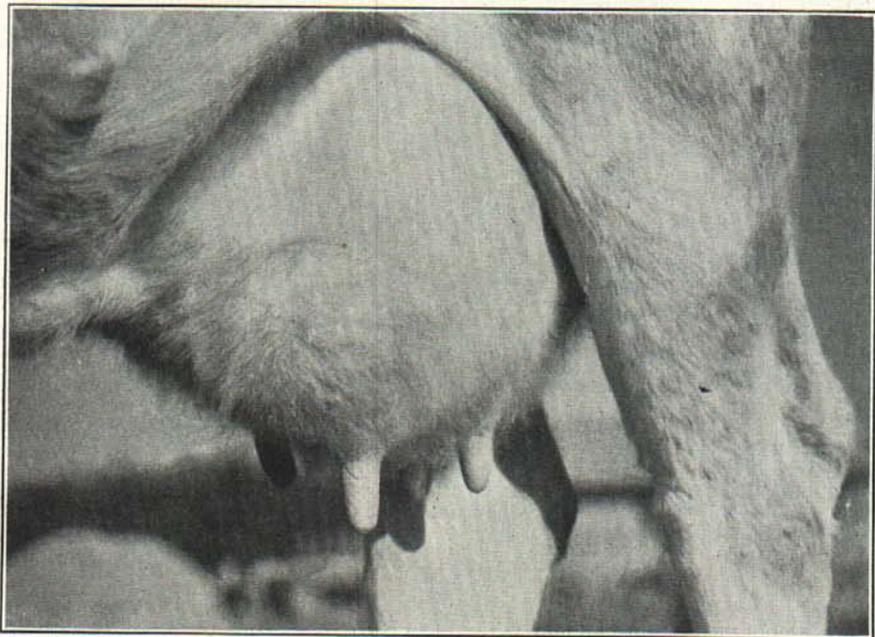


Fig. 3a. Streptococcus infection of the udder injures the secreting tissue, which is then replaced by scar tissue. This replacement is progressive and finally results in altering the appearance of the udder. An unevenness of the udder may develop because of the swelling of one or more quarters or the decrease in size of one or more quarters or both. The changes found in the udder do not indicate the length of time that a cow has been infected; in some cases scar tissue forms rapidly while in others it forms slowly. This udder is affected with chronic mastitis and is characterized by an enlargement of the left front quarter, together with decrease in size of the left rear quarter. Scar tissue is present in both quarters, and streptococci are being eliminated in the milk. The milk producing ability of such an udder is greatly reduced. (See Fig. 3b.)

from the standpoint of money invested and time and feed consumed in maintaining the excess cows.

2. In studies conducted at Michigan State College it was found that milk from infected cows was inferior in quality as determined by flavor, chloride content, leucocyte content, sediment test, bacteria count, and methylene blue test. Ninety per cent of the milk samples from infected cows in one herd were criticised as having a saltish flavor, while only 14 per cent of milk samples from a streptococcus-free herd were so criticised. The animals in the mastitis-free herd giving a saltish milk are near the end of their lactation period when such changes may normally occur. Only 50 per cent of the streptococcus-infected cows produce a Class 1 milk (good) as judged by the methylene blue test, as compared with 98.5 per cent of the non-infected cows. In like manner, 68.5 per cent of the infected cows produce milk with a bacteria count of more than 1,000 per cubic centimeter as compared with 5.8 per cent of the non-infected cows. The milk obtained from normal udders has 50 to 500 bacteria per cubic centimeter, and the number should not exceed 1,000 if low-count milk is to be produced. Were it not for the dilution of such abnormal milk with normal milk, more would be heard from consumers about these deficiencies.

3. The easy spread of streptococic mastitis causes an increase in herd wastage. The animals that "go bad" because of the infection

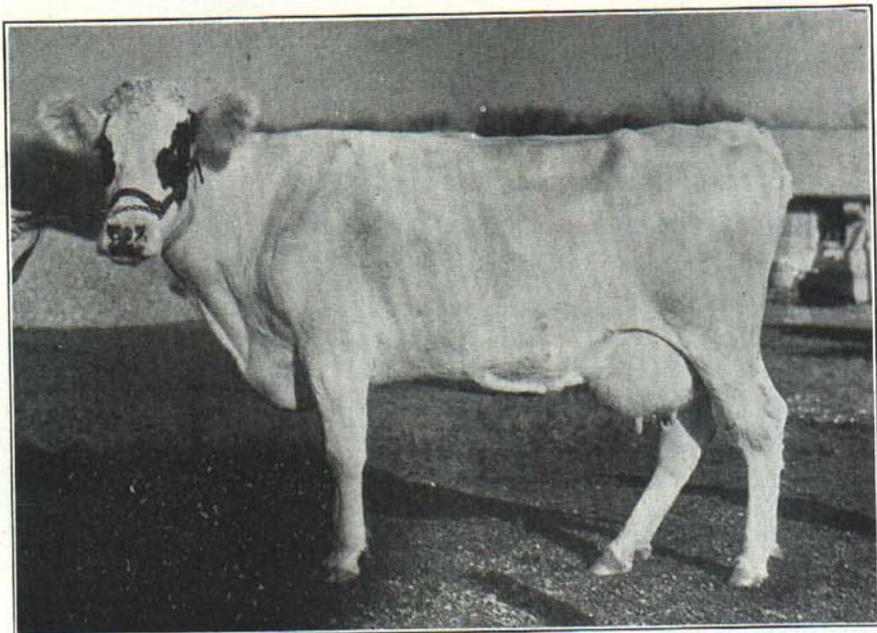


Fig. 3b. Cows suffering with chronic mastitis, of which this cow is an example, may not show any change in their general physical condition even though there are local physical alterations in the udder. A close-up examination of the udder is more convincing than a word picture would be concerning the unevenness of the udder. (See Fig. 3a.)

must be eliminated, even at a great loss of money. In addition, the infection spreads and reduces the production of the cows concerned and the elimination at a loss must extend to any recently infected animals.

4. Streptococcus-infected milk should not be consumed in the raw state because of the possibility of human infection. This may take the form of epidemics of septic sore throat, if a streptococcus of human origin is involved, or isolated cases of human infection when certain bovine as well as some human streptococci are concerned. Only persons free from sore throats and open sores on their hands should milk the cows.

5. It has already been pointed out that streptococcic mastitis-affected cows may produce a milk containing less fat and less milk sugar (lactose) than normal. Owing to these deficiencies such milk is inferior in nutritive quality as well as bacteriological quality.

TESTING FOR STREPTOCOCCIC MASTITIS

Testing for streptococcic mastitis can best be carried out cooperatively by the dairyman, veterinarian, and laboratory worker. The history and data obtained by each are valuable in properly determining

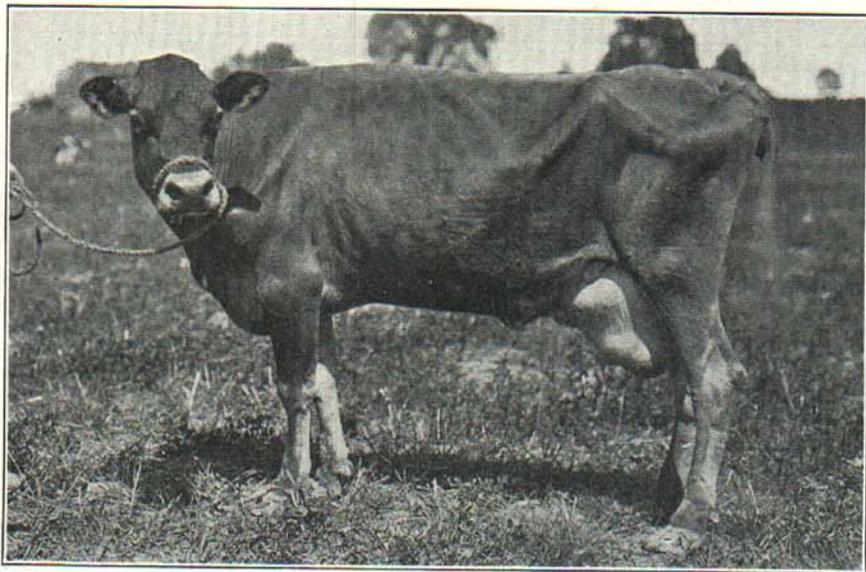


Fig. 4. The streptococcus infection may become sufficiently active to break through the outside udder tissues. The open sores become drains for the pus and bacteria found within the infected udder. The cow pictured in Fig. 4 was such a case. In this case the open sores were on the opposite side of the udder from that shown in the picture. This not only makes the udder unsuitable for the production of milk and aids in the further spread of the infection in the herd, but the mastitis may change the general physical condition of the cow. The slaughter value of such an animal is greatly decreased, and she usually is sold at a great loss as compared to her value prior to suffering with mastitis.

the status of each lactating cow. The part of each one will be briefly discussed.

1. *The dairyman*—It is essential that the dairyman be interested in the health of his herd before he undertakes this work. He must be mastitis-conscious and willing to apply certain sanitary procedures that may be recommended by the veterinarian. A strip cup should be used to detect flakiness of milk. At each milking the first two or three streams of milk from each quarter should be collected in a cup with a wire

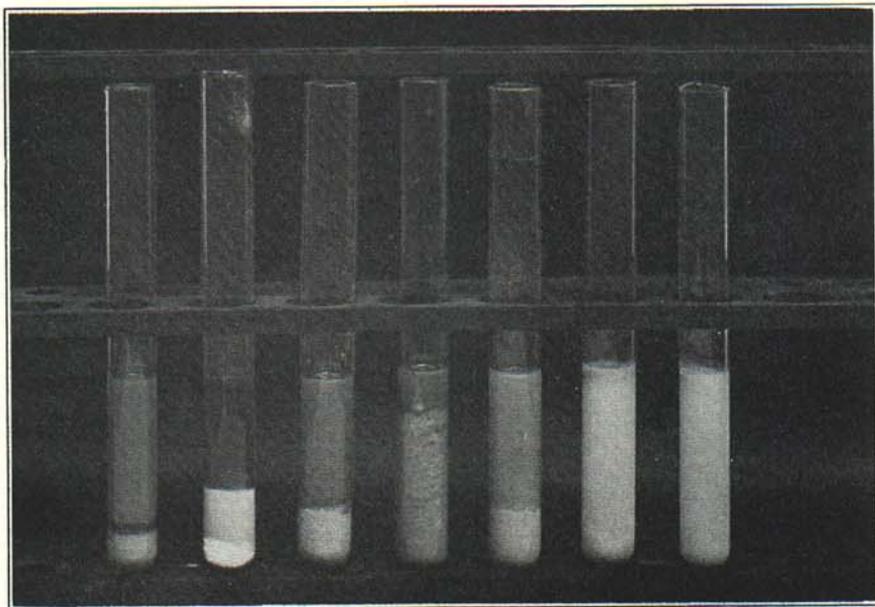


Fig. 5. The physical appearance of the milk secreted is not an accurate indicator of the presence or absence of mastitis. If abnormal milk, such as is illustrated above, is secreted and an injury of the udder is not responsible, it suggests streptococcic mastitis infection. All of these milk samples, including the normal appearing milk on the extreme right, were obtained from infected cows. This normal appearing milk contained many streptococci and pus cells. It is this abnormal milk that should interest the dairyman sufficiently to check more accurately on the herd condition. A physical examination of the udder and laboratory examination of the milk from each cow should be made as a basis for a proper diagnosis. See Fig. 6a for the appearance of milk at extreme right under the microscope.

or black cloth covering, thereby making it possible to detect the flakiness which frequently is present in milk from an infected udder. A record should be kept of these results so that they may be referred to in obtaining a history of the physical condition of the milk produced by each cow. A strip cup may be purchased from various dairy supply houses or can be made by using a rubber band to hold a black cloth over the top of a tin cup.

2. *The veterinarian* should make a physical examination of the udder of each cow. The physical examination of the empty udder determines the presence or absence of scar tissue. The scar tissue develops at the expense of, or replaces, the secreting tissue, for which reason cows with badly scarred udders are usually not profitable cows to have in a herd. The presence of scar tissue in the udder, and blind and swollen quarters are indicative of streptococcic mastitis. Instances have been encountered where such alterations were the results of injury to the udder and, conversely, many cows may be affected with strep-

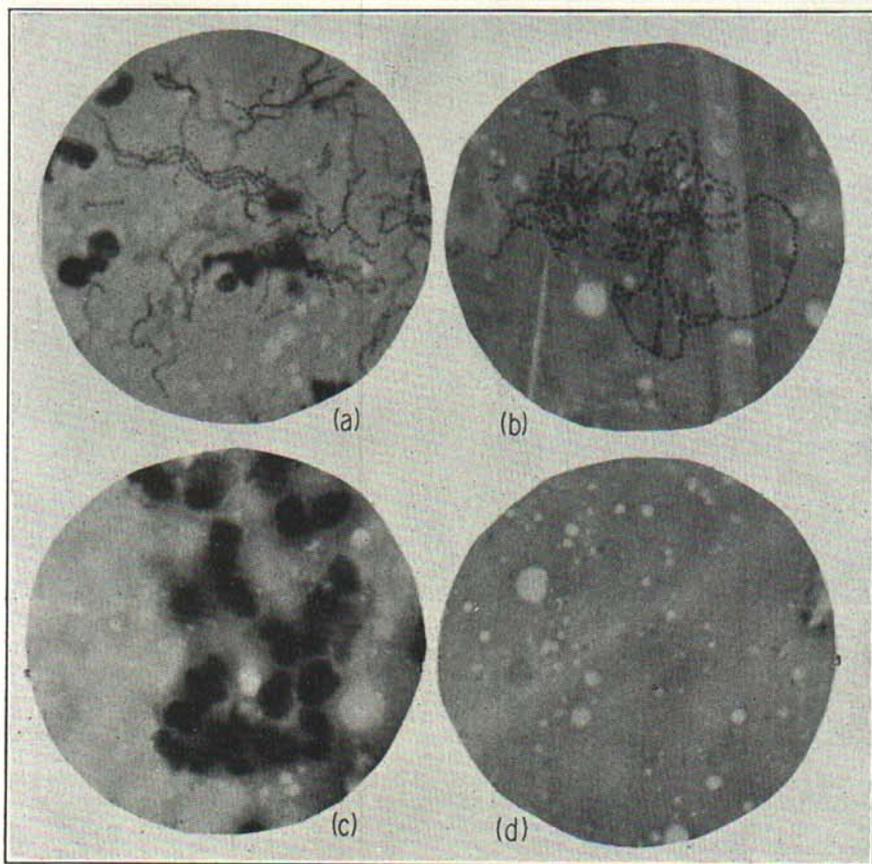


Fig. 6. The microscopic appearance of milk from cows classified by the microscopic test for streptococcic mastitis is illustrated above. (a) Leucocytes in excess of 1 million per cubic centimeter and streptococci—infected; (b) less than 1 million leucocytes per cubic centimeter with streptococci—infected; (c) leucocytes in excess of 1 million per cubic centimeter with no streptococci—suspicions (retest within one month); and (d) less than 1 million leucocytes per cubic centimeter and no streptococci—non-infected. Some milk that appears normal on physical examination is grossly abnormal when examined by the microscopic test. Part (a) illustrates the appearance of the sample on extreme right in Fig. 5 when placed under the microscope.

tococcic mastitis that has not progressed to the point of being detected by physical examination of the udder or milk. For these reasons an additional laboratory examination of the milk is desirable if streptococcic mastitis is to be controlled in the herd. If a laboratory check-up is to be made, it is desirable to have the veterinarian properly collect and identify the milk samples.

The udder of each cow should be wiped with a clean cloth (moist with an antiseptic), a few streams of milk discarded from each quarter, and the milk collected directly in a sterile tube containing brilliant green (0.1 cc. of a 1-500 dilution to be diluted with 10 cc. of milk) as a preservative. Such properly collected and preserved milk samples may be shipped by parcel post without danger of spoilage.

3. *The laboratory* testing consists in incubating the properly collected milk samples so that the streptococci will increase in numbers if present, and then examining the milk with the microscope for the presence of streptococci and pus cells. On account of the easy spread of the infection to other cows of the herd, repeated testing is desirable in a program of streptococcic mastitis control.

The Pathology Laboratory at Michigan State College has facilities for running this laboratory test. Sterile tubes containing the preservative may be obtained from this laboratory at a cost of 2 cents per tube if samples are to be submitted for examination. An additional small charge is made for the test.

PREVENTION AND CONTROL OF STREPTOCOCCIC MASTITIS

1. Determine whether the herd is infected and which cows are infected.

2. Dispose of the badly infected cows immediately by slaughter. The aim should be to eliminate ultimately all affected cows and thus create a streptococcus-free herd. Such a herd can be maintained free of streptococcic mastitis.

3. Until removal from the herd, segregate infected and suspected cows at one end of the milking line or in another stable. These cows should be milked last. This procedure reduces the possibility of carrying the bacteria to the non-infected cows.

4. Use properly constructed stalls or stanchions. Partitions between the cows and platforms of proper length and kind are helpful in preventing udder injury.

5. Employ sanitary measures in the barn at all times, such as:

- a. Before milking, wipe the udder of each cow with a clean cloth moistened with chlorine solution.
- b. Discard the fore milk into a strip cup.
- c. In hand milking, wash hands before milking each cow.
- d. In machine milking, dip teat cups in chlorine solution before milking each cow.
- e. Permit plenty of sunlight to enter the barn.
- f. Use lime or superphosphate on the pavements and platforms.
- g. Milk the infected cows last and properly dispose of their milk.

6. Test the milk and have a physical examination made of replacement cows before purchase or buy them subject to such test. If bought subject to test, isolate until tested. Such precautions will practically eliminate the danger of introducing mastitis into the herd.

7. Proper preventive vaccination may be a valuable addition to the sanitary measures in those cases where the infected cows must remain in the herd for some time. Consult your local veterinarian.