Septic Sore Throat Epidemic at School

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AN investigation was made on June 10, 1942, of two outbreaks of sore throat which had occurred among the students, teachers, and other employees of the school, one in February and the other during the first week in June. The school physician, as well as other school authorities, had suspected that the disease came from the milk supply. The investigation revealed that on February 6 one of the older boys, a student at the school, had reported to the infirmary with a sore throat. He was found to have what appeared to be an extremely septic throat, and was immediately put to bed. On the following day it was necessary to open a paratonsillar abscess which had developed in this patient. This boy was one of the school boys who aided in taking care of the dairy herd of the school, in milking, and in caring for the milk. On the morning of the day that he reported to the infirmary with a septic throat, he had assisted in the milking. On February 6, the date of the onset in the first case, a total of 124 students, teachers, and other employees lived either in the school dormitories or on the school grounds, all of whom obtained their milk supplies from the school dairy.

The attack rate rose abruptly from less than 1 per 100 on February 12 to 15.8 per 100 on February 13, the highest attack rate obtaining on February 15, when it reached 20.2 per 100. On February 16, this rate dropped to 15.2, after which it fell abruptly to a rate of 1.5 per 100 on February 18. After this date, it fluctuated between zero and 10.6 per 100 until March 2. From then on, no further cases occurred until the week of May 30 through June 5, during which time 18 cases occurred among 46 visitors who came to the school and took up residence for a conference that was to be held.

The outbreak was quite explosive, the greatest number of onsets and the highest rates obtaining on February 13, 15, and 16. The explosive nature of this outbreak is further emphasized by the daily sore throat sick census for the school.

On June 10, the State Epidemiologist and Milk Sanitarian went to the school to investigate the outbreak. On this date only 59 students, teachers, and other school employees remained at the institution. All of those among the visitors who had developed sore throat had recovered, except one, and while this patient was up and around, he still complained of a sore throat. Throat cultures were taken from each of the 59 resident persons and planted on blood agar plates. After incubation of these plates for a period of 24 hours, it was found that 22 of the 59 individuals had hemolytic streptococci in their throats. One of these 22 was the vistor whose throat remained sore. This high percentage of individuals with hemolytic streptococci in their throats certainly suggested that an infection, caused by this organism, had, within the recent past, been fairly widespread in the school population.

While the epidemiological information was being obtained from the nurse and school physician and while the throat cultures were being taken, the Milk Sanitarian was investigating the dairy herd of the school. On the day of the investigation, 10 out of a total herd of 14 cows were being milked. All of these cows had been tuberculin- and Bang-tested within the past year and no reactors found. This herd produced, on an average, about 40 gallons of milk per day, all of which was consumed at the school. Strip-cup tests were taken from each quarter of each of the 10 cows. Cultures from these specimens of milk revealed hemolytic streptococci in one or more quarters of the udders of 3 of the 10 cows. Cultures from specimens of these 3 cows also revealed *Staphylococcus aureus* or *albus*, one or both. The other 7 cows all showed *Staphylococcus aureus* or *albus*, the aureus being hemolytic in every case.

On inspection of the dairy barn, it was found that concrete floors were broken and irregular, the barn and milk house walls needed white washing or painting, the milk cooler was dented and in a poor state of repair, and the milk pails had broken seams which were roughly soldered. All utensils with which the milk came in contact had a slightly greasy feel, and on the cooler was a considerable deposit of old dried milk near the bottom tubes. There was no chemical disinfection or steam sterilization of milking utensils. The cotton disks through which the milk was strained were exposed to dust and flies. No chlorine was used in the water with which udders and milkers' hands were washed. Milk stools were dirty. It was found that the milk was cooled at the milk house, placed in 5 gallon cans, which were, in turn, taken to the kitchen refrigerator. At 6:00 P.M. the temperature of the afternoon milk in the cans in the refrigerator was 70 degrees, while the inside temperature of the refrigerator was 56 degrees. Two students milk the cows in the dairy barn. Each pail of milk was strained in the straining room of the milk house. Milk then flowed by gravity through a short sanitary pipe connecting, through the milk house wall, onto a tubular cooler. The milk flowed over the tubular cooler, which was located in the same room as that used for washing and storing utensils. The cooling medium was the water from the reservoir that provided the school water supply. Milk was coming off the cooler at approximately 70 degrees. At meal time the milk was placed in large aluminum pitchers and these pitchers were set in the center of each table, so that each individual, student, teacher, employee, or visitor could drink all the milk he wanted.

CONCLUSIONS

1. Septic sore throat was epidemic among students, teachers, and employees of the school in February and March of 1942.

2. This disease recurred in epidemic form among some visitors to the school during the first week of June, 1942.

3. Hemolytic streptococci were cultured from specimens of milk obtained directly from the udders of 3 to 10 cows that were producing milk for the school at the time of the investigation.

4. Specimens of milk obtained from the udders of the 10 cows in the dairy herd contained *Staphylococcus aureus* or *albus*.

5. Improper cleansing and disinfection of milk utensils, milkers' hands, and cows' udders increased the possibility of pathogenic organisms finding their way into milk, and inadequate cooling and refrigeration permitted multiplication.

6. The period of 7 days that elapsed between the date when the first case was recognized in a milker and the date when the first large number of onsets occurred was long enough for this milker to have infected cows' udders, mastitis thus arising and serv-

ing as foci from which organisms entered the milk in which they multiplied and were carried to the victims.

7. The fact that two outbreaks of septic sore throat, both explosive, one over a period of 20 days, the other 3½ months later in a visiting population and covering a period of one week further strengthens the suggestion that the epidemic was milk-borne.

PRINCIPLES INVOLVED IN SHORT-TIME PASTEURIZATION OF MILK *

Certain problems connected with short-time pasteurization of milk have occasioned much discussion but apparently have not been brought to a solution. The author interprets the principles that have been employed successfully in the scientific advancement of heat sterilization of canned foods in such a manner as to facilitate the application to milk pasteurization of a method of treatment analogous to that applied to canned foods. The manner of using this scientific method to solve the problems associated with milk pasteurization is described specifically, with especial emphasis upon an explanation of why a high-short pasteurizing process appears sometimes to be equivalent to the ordinary low-temperature long-hold process whereas at other times the former process appears to have less bacteria destroying power than the usual long-hold process. Mathematics is used to explain this puzzle by showing, first, that the relationship between different pasteurizing processes depends upon the particular kind of bacteria one is interested in destroying, and second, that the time taken to heat the milk to pasteurizing temperature and to cool the milk from pasteurizing temperature may make a material contribution to the bacteria-destroying power of the process.

The efficacy of the pasteurization process of 30 minutes at 61.7° C. (143° F.) has been established by years of experience. Calculations based on the bacteria-destroying value of this process as a reference standard show the comparative value of processes at other times and temperatures in destroying different types of bacteria. On the basis of available data, it was found that 19.2 seconds at 71.7° C. (161° F.) has destructive power equivalent to 30 minutes at 61.7° C. (143° F.) for one important kind of bacteria *(Br. suis)* but that for *S. aertrycke,* another type of bacteria which is important but less likely to be present in milk, a process of 3 minutes 20.4 seconds at 71.7° C. (161° F.) is required to have destructive power equal to that of 30 minutes at 61.7° C. (143° F.).

This principle is important in a consideration of any test for proving the sufficiency of a pasteurization process, such as the phosphatase test. Assuming that the enzyme phosphatase in milk is inactivated by heat at the same rate at which a simple chemical reaction takes place, one finds that for this test a process of 3 minutes at 71.7° C (161° F.) will produce the same results as those that are produced by a process of 30 minutes at 61.7° C. (143° F.).

These equivalents are based on actual heating time at the given temperatures with instantaneous rise to

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