Pasteurization of Small Milk Supplies

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The importance of the pasteurization of small milk supplies at first glance is all out of proportion to the volume of milk involved and to the time which would be necessary in supervision. In this State, exclusive of New York City, about 73 percent of the milk is pasteurized. This represents an enormous volume of milk, yet the remaining 27 percent is our big problem. To adequately appreciate and understand the necessity for undertaking a program which eventually will result in reducing to a minimum the volume of raw milk used, we should study our records of milkborne outbreaks. We have known for years that such outbreaks are almost always due to raw milk.

Let us see where these outbreaks occurred. From 1917 to 1927 there were 84 outbreaks recorded. Of this number 57, or 68 percent, occurred in "rural" areas, while 27, or 32 percent, were in the "urban" population centers. During that period pasteurization was first beginning to emerge as a standard practice. From 1928 to 1938 pasteurization increased tremendously and naturally the increase was in the urban centers. What was the effect of this on our milkborne outbreak record? During that period 1928-1938, we still had outbreaks, 67 of them. Not a very substantial decrease as compared with the previous 11 year period. But the startling fact is this: Of the later number only 4 or 6 percent were in urban communities while 63 or 94 percent were in the rural areas. From 1917 to 1927 there were 2 outbreaks in small places for every one in the cities, while in the next 11 year period the ratio was 16 in the rural to 1 in the urban. So it is plain that we should be concerned with milk supplies in rural areas.

Even though the volume of milk is relatively small, the population affected is not. The term "rural," as used in this discussion means communities of 12,400 or less. This figure was used because one-half of the population of upstate New York resides in such places. In other words the amount of raw milk under consideration is small, but the population in the area is equal to the population in the larger communities which are now, through the extensive use of pasteurized milk, protected from the dangers of milkborne outbreaks.

There is another reason, a very current and pressing one, why efforts should be made to bring about the pasteurization of small milk supplies. There is hardly a community of any size which is not confronted with the problem of sales of milk at the farm and at roadside stands. In the main such supplies are comparatively small, yet in the aggregate a rather large number of consumers are involved. It has been said that these operations flourish because consumers want raw milk and because such type of milk is not available in the cities, consumers go to the farms for the milk. Surveys have shown that it is not a question of raw versus pasteurized milk—but a matter of price. If the small dealer could find a practical way to pasteurize his milk, many of the producer dealer and farm supplies would be pasteurized.

All this has been recognized for
years, at least by a few men. One in particular has worked hard with manufacturers trying to show them the problem and pointing the way to the solution. At last such efforts are bearing fruit, for there is in operation in this State equipment which is efficiently and practically pasteurizing small quantities of milk, from 50 quarts upward. Mr. Tiedeman of this Department has been the driving force behind this movement.

A pasteurizer for small quantities of milk (50 quarts or perhaps even less and upward) must be:

1. Capable of pasteurizing milk in accordance with the provision of Chapter III of the Sanitary Code.
2. So operated and constructed as to result in a good quality milk, that is, the milk shall have good flavor, good keeping qualities and good cream line.
3. Within a price range which makes it practical to purchase and operate.

Such equipment is now on the market. There are two classes of pasteurizers designed for the pasteurization of small quantities of milk: (1) the in-the-bottle pasteurizer, and (2) the vat type. The present in-the-bottle pasteurizer is so designed, constructed, and operated as to overcome the faults encountered with the old time in-the-bottle pasteurizer. Each bottle, no matter what its location in the pasteurizer is properly pasteurized. All milk in each bottle, top, middle, or bottom, is also properly pasteurized. In other words, this apparatus does the job of pasteurization. Further, cream line and taste studies indicate that quality is not impaired.

Briefly the system consists of two large Bethanized sheet steel tanks, similar to the commonly used can cooling tank, in which water at a predetermined and controlled temperature is circulating rapidly. Oversized lightweight milk bottles and welded wire milk crates are used. Neither standard weight milk bottles nor wooden crates can be used. The bottles are placed in properly designed wire crates which set on a false bottom or rack in order to insure unobstructed circulation of the heating water. The temperature of pasteurization is determined and controlled by the temperature of the circulating water. Extensive tests were made to determine how long it would take to pasteurize properly milk with water at a definite temperature. Repeated tests showed that with milk at 40° F. it would take one hour to pasteurize a full load of bottled milk with circulating water at 144° F. After the bottled raw milk has been placed in the vats the cover is secured. An extra pen on the recording thermometer which records the temperature of the water, is actuated by the raising or lowering of the cover. The pen is also connected with the pump circuit and shows when the circulating pump is operating. For acceptable pasteurization, the recording chart must show a water temperature of 144° F. for one hour without any record that the cover has been raised. Data indicated that it takes the milk from twenty to twenty-five minutes to reach 143° F. with the circulating water at 144° F. For safety the heating period is figured as one-half hour. Hence the holding time is calculated at the end of this period. Immediately after holding, the cases of milk are removed, placed on the floor for five minutes and then immersed in the tank containing circulating cooling water. Racks are so made as to keep the closure of the bottles above the level of the water during cooling. Storage of the milk may be within the cooling vat or in a cold storage room. The method will depend on the quantity of milk handled. This type of pasteurizer is made in two sizes, the small holding 48 quarts, the large 96 quarts. Oversize bottles to take care of expansion during heating are required. Likewise waterproof cover caps are necessary. Heating of water is done electrically and the temperature of operation is controlled by control of water temperature. No steam boiler is needed.
From the viewpoint of public health this method of pasteurization is ideal. It assures that the milk will be sold as bottled milk (not dipped); that no contamination can take place after pasteurization; that in the event that bottle washing is not satisfactorily done, the bottle as well as the contents are subsequently pasteurized; that there will be available at the plant hot water which can be used for washing operations; that any quantity of milk from a single bottle up to the capacity of the apparatus can be properly pasteurized. The cooling section has capacity for storing three times the quantity of milk that can be pasteurized in one run. Like all equipment there are certain features which are not ideal. One is that the cost of the equipment at present is somewhat higher than was anticipated. The operating cost is normal. Because Bethanized steel cannot be obtained at present for this use, a copper lining is needed to resist rusting which increases the cost. At the present time, due to the program adopted by the Priorities Board of the O.P.M., quantity production of the pasteurizer does not seem to be possible.

There are two types of small vat pasteurizers now on the market. One type is similar to if not in every respect identical with the larger vats with the exception of size. Various sizes are available, the smallest being 120 quarts. They are water jacketed vats, with agitators, valves, indicating and recording thermometers of acceptable design and construction. Operation is the same as for the larger vats. Cooling is usually accomplished by means of a surface cooler. Steam boilers are needed. Little if any more needs to be said regarding these vats for we have all been working with the larger type for years.

However the other type of small vat pasteurizer and the vat to be considered deviates from the standard design. The smallest size is 40 quarts, although it is believed that the 80 and 120 quart sizes will be more popular.

The problem of the pasteurization of goats' milk may be solved by the use of this small sized pasteurizer. Here-tofore generally only makeshift equipment has been used. Now a satisfactory pasteurizer suitable for this product is available. The pasteurizer is an upright cylindrical water jacketed vat, with agitator, valves, indicating and recording thermometers of satisfactory design and construction. Heating is by means of hot water at about 160° F. which is circulated through the water jacket. When the milk reaches the pasteurizing temperature the hot water is immediately drained off. This can be done rapidly as the volume within the water pocket is small. During the holding period the drop in temperature of the milk is so small as to be negligible. If, however, for some reason the temperature does drop, hot water can again be circulated in the jacket. After the holding period, tap water is circulated within the water jacket. Rather quickly the temperature may be lowered to about 100° F. Ice water should then be circulated to cool the milk to proper cooling and storage temperatures. The hot water may be heated by means of an ordinary laundry coal stove, side arm gas heater, or electrical immersion unit. This water is stored in an open tank and then pumped through the vat. It is recirculated. No steam boiler is therefore needed for the operation of this type of pasteurizer. The hot water storage makes available hot water for washing operations. This pasteurizer was designed especially for small dealers who are now selling milk at the place of production. However, as with the other vat type bottling equipment can be used in conjunction with the operation.

Prices for the various pasteurizers without boiler, bottle filling machines, cappers and bottles ranged from approximately $300 for the last described type to about $1,000 for the in-the-bottle pasteurizer. These prices include both indicating and recording
It should be noted that the in-the-bottle type includes an electrical refrigerating unit and storage capacity for the bottled pasteurized milk. The other vat types are under $1,000, the price varying with the capacity. The prices are approximate and due to the emergency, may “change without notice.” Efforts have been made by manufacturers to keep cost down without impairing efficiency. How well they have succeeded can be judged by the fact that there are on the market now pasteurizers capable of pasteurizing small quantities of milk at prices way below any which we have had heretofore.

This type of equipment should help us solve several vital problems which are before us. First, there is no reason now why small communities served by dealers handling small quantities of milk cannot secure that protection which only pasteurized milk can give. The criticism that equipment adaptable to these conditions is not available is not true now. Equipment is available and it is now up to us and up to consumers to see to it that the rural population is just as well protected from the dangers of milk-borne outbreaks as are the people in urban centers. Furthermore, the use of these small pasteurizers should help us in giving to these people in cities, who insist upon going to the farm for their milk, milk which is properly pasteurized. It is believed that a program may be worked out, whereby pasteurized milk will be used, almost exclusively throughout the State. There apparently is no unsurmountable obstacle in the way. Objection may be made that the cost, even though low, would naturally cut profits. This is true, yet the additional cost, if passed on to the consumer would be very cheap insurance. Further lowered costs, with the advantages, can be secured by the cooperative use of small pasteurizers. Several small dealers going together at a low per capita outlay can make available this equipment. The overhead per quart would be reduced and also it would be possible for each dealer to keep his own milk intact. A dealer, with high fat milk or milk with some so-called special characteristic could pasteurize and handle his own supply.

When public health is involved, there should be no compromise. It has been said and I’m quoting, “the business man, like the savage, must occasionally put his ear to the ground to get the tendencies of the time and then prepare to meet them. Furthermore the financial interests of any individual or group cannot properly be weighed against the protection of the community as a whole.”

Let us put our efforts into a program which eventually will result in making available to our entire population pasteurized milk. The means to do this are now available.

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and

AMERICAN PUBLIC HEALTH ASSOCIATION

Both at St. Louis, Missouri

October 30–31 and 27–30 respectively