Administrative Public Health Problems in Milk and Milk Products*

LLOYD ARNOLD, M.D.

Department of Bacteriology and Public Health, College of Medicine, University of Illinois, Chicago, Illinois

THERE are many problems arising in the public health administration of a municipal milk supply that in these days require considerable thought and study. The lack of uniformity of these administrative practices illustrates the confusion in the minds of administrative officers.

The regulation of a municipal fresh fluid milk supply can, for convenience, be divided into three phases or stages:

The prepasteurization of raw milk.
The pasteurization.
The postpasteurization.

PREPASTEURIZATION

The regulation of the production, handling, and transportation of the raw milk is the most difficult phase of regulation from an administrative standpoint. The dairy farms producing milk are beyond the police jurisdiction of the municipality consuming the milk. The usual procedure is to issue certificates of approval, sanitation, or permits to such producing farms after certain physical requirements have been met. The type of inspection differs on various milk sheds. In many areas, the industry assumes the burden of this inspection under varying degrees of health department supervision. In some instances the entire inspection of dairy farms is done by the health department. Then again, there is a dual inspection service: one maintained by the industry and another by the tax-supported health department.

There are two schools of thought and practice relative to the standards for the quality of a raw milk supply transported into an urban community. One group contends that there are no practical methods of examination that can be used to determine the sanitary quality or public health safety of the raw milk supply; hence the necessity of controlling and regulating milk on the farm when and where it is produced. The other group places greater emphasis on the sanitary quality of the milk after it leaves the farm and before it is pasteurized. This latter group usually enforces environmental sanitation of dairy farms by inspection, but places more emphasis on the examination of the milk supply by the Breed direct microscopic test, methylene blue reductase test, taste and odor of the milk, etc. A combination of these tests is in use in some of our largest milk sheds. When one examines the available records, there does not appear to be any detectable public health advantage enjoyed by the consumers as a result of the use of either of these two procedures for regulating raw milk.

Healthy cows, safe water supply, sanitary disposal of human excreta, properly constructed barns, and milk houses with the physical equipment for the cleaning and disinfecting of utensils and the cooling of milk can be determined by inspection. The daily use of these facilities by the producer is a personal equation and habit factor which cannot be enforced by inspection by the health department. Healthy cows, cleanliness, and proper cooling

* Read before The American Public Health Association, Atlantic City, October 17, 1941.

are the underlying factors in farm sanitation.

A careful review of the literature, combined with personal administrative experience, has failed to show an advantage of the present *Standard Methods* of bacterial plate count as a proper index for the sanitary quality of milk. The use of newer media and lower incubation temperature has contributed toward confusion in interpretation of the significance of bacterial plate counts. It should be remembered that bacterial plate counts are only one of the various methods of escertaining the sanitary quality of milk, and likewise it should be kept in mind that this method is subject to considerable variations due to the involved technical procedures. This is the most expensive yardstick we employ in determining the sanitary quality of our milk supply. Its proper place should be only as one of the tests, but alone it can be misleading, particularly unless a large number of samples are repeatedly examined, thereby considerably increasing the costs of regulation.

PASTEURIZATION

The major development in the last decade in milk sanitation has been in improvement in pasteurization. It is true that we have used pasteurization for three decades to aid in safeguarding our milk, but there has been considerable progress made in perfecting the technic and equipment used in the actual pasteurization process. The development of the phosphatase test has given us confidence in the efficiency of these new methods and devices. The pasteurization of milk carried out in modern equipment, with its automatic controlling accessory and safety devices, represents an engineering development that is making this treatment really precise.

POSTPASTEURIZATION

This period of regulation includes the time interval after the milk is pasteurized and until it is delivered in fresh fluid form to the consumer. If we could deliver to the consumer a bottle of milk equal in sanitary and health promoting qualities to the milk that leaves the pasteurizer, some of our health department problems might be solved.

The bacteriological control of milk before and after pasteurization presents different problems. The raw or prepasteurized milk contains a variety of bacteria: some come from the udder of the cow, some from the environment of the barn, and many are derived from utensils, milking machines, and various pieces of equipment that may not have been cleaned properly. The latter group is usually thermoduric and survive killing temperatures for disease-producing bacteria. The postpasteurization bacterial flora of milk have more to do with keeping qualities of the milk than with the public health significance of the bacterial flora as determined by refinements of established technical procedures. We do not have practical methods nor do we attempt to apply quantitative bacteriological procedures to determine disease-producing bacteria in a milk supply. Our methods at present consist of determining all of the bacteria that may grow in a milk sample under strict and standardized procedures of media composition and incubation temperature. The media and temperature are more concerned with determining the keeping qualities of the milk than with the public health significance of the milk sample. Every administrative officer should separate the commercial advantages of increasing keeping qualities versus the protection of the health of the public.

The total qualitative bacterial count of milk after pasteurization is not as significant (as now practiced) from a general sanitary standpoint as before pasteurization. When milk is bottled in small retail containers, the opportunity for contamination by human bacteria are enhanced. When a 10,000

gallon tank of milk is brought to the pasteurizer and then broken up into 40,000 to 50,000 individual units, each handled several times by different hands, the opportunity or probability of contamination is increased in proportion to the surface exposure of the retail package. This necessitates protection of the milk from contamination also after pasteurization and bottling. Hood closures that will be as effective in protecting the contents of the bottle as the pasteurization equipment is effective in destroying harmful bacteria, are certainly essential for a safe milk supply.

A total bacterial count of a quart of pasteurized milk may be 10,000 bacteria per ml. immediately after filling and cooling, and 15,000 when delivered to the consumer. If this is due to contamination of bacteria of human origin, such as salivary or fecal bacteria, then such a milk is unsafe for human consumption. But if the increase is due to lack of cooling or refrigeration, then there should be little apprehension as to the public health significance of the fifty percent increase in the bacterial count. The significant factor in postpasteurized milk is the types of bacteria present in the milk—are they survivals of the prepasteurized flora or are they added to the milk after it was pasteurized due to human contact?

DISCUSSION

There are many unanswered questions concerning administrative problems in controlling and regulating a municipal milk supply. Suppose a raw milk has a bacterial plate count of 100,000 or 1,000,000 per cubic centimeter and is properly and effectively pasteurized. Has the postpasteurized product, if efficiently protected from extraneous contamination, any different nutritive properties in these two samples? There is nothing in the literature to show any differences upon the health of the consumers of these two hypothetical samples. All of the observations bearing on this question were made before we had effective pasteurization equipment and chemical methods of checking and verifying the efficiency of the process.

The public health regulations governing and controlling milk should be for the purpose of insuring a wholesome and nutritious milk, free of disease-producing bacteria and irritating substances. If these regulations are extended beyond this field, they may become a burden to the industry and the consumer.

The death rates for typhoid fever serve as an index of sanitation in a community. The death rates per 100,000 *rural* population in 1900 was 45.8, in 1910 it was 23.3, in 1920 it was 9.6, in 1930 it was 6.6 and in 1939 it was 1.8. This indicates that our rural population has approximately equally sanitary safeguards as the urban population. Table 1 shows the typhoid death rates for the total population, urban and rural, in the United States Registration Area from 1910 to 1939. We can no longer regard the rural areas as typhoid reservoirs. As the sanitary environment of our rural areas improves, the hazards of contamination from this source decrease in the same proportion.

TABLE 1

UNITED STATES REGISTRATION AREA TYPHOID DEATH RATES

Year	Total	Urban	Rural
1900	35.4	19.7	45.8
1910	22.8	22.4	23.3
1920	7.6	5.5	9.6
1930	4.8	2.8	6.6
1935	2.8	2.2	3.6
1939	1.6	1.4	1.8

Public health practice and procedures change with the advancement of knowledge, and the regulations are adjusted to meet the situations as they exist. A Committee on Administrative Practice in regard to communicable diseases of this Association frequently makes reports embodying its recommendations relative to methods, procedures,

etc. to reduce the incidence, morbidity and mortality of certain diseases or groups of diseases. Some of these recommendations have involved radical departures from the usual quarantine and placarding practices. These have, as a whole, been favorably accepted by the public health administrative officials. Why cannot the same practice and policies be carried out by the divisions of the health departments concerned with milk control as is and has been in vogue in respect to communicable disease control?

We began our farm sanitary regulations governing milk production when the rural areas were reservoirs for enteric diseases. The last two decades show a marked improvement in rural sanitation; in fact, the incidence of typhoid fever is the same as in urban communities. The first handler of the dairy farm's milk, the receiving station, can now be used as the testing area to determine if utensils are clean and disinfected, if the milk has been kept cool, etc. We can now shift our administrative control with a reasonable degree of assurance from the broad shed to the bottlenecks where we can regulate and examine the product in a practical manner. The facilities for proper milk production can be ascertained by farm inspection which can be made less frequently than when we attempt to control the sanitary quality of the milk on the farm.

We should continue the present regulations regarding pasteurization. These rules are rigid and capable of being supervised and checked by various recording devices during operation, and by chemical tests to determine if all of the milk has been properly pasteurized.

We need to place more emphasis on the postpasteurization handling of milk. Better packaging of the pasteurized milk is desirable. The human contact with the final consumer's bottle of milk requires more study in order to make this phase equal in efficiency to the prepasteurization and pasteurization phases. The cleansing and disinfection of the bottle can be carried out with modern equipment if the operation is supervised comparable to the scrutiny given to pasteurization equipment and its proper operation. The milk must then be protected against contamination and adulteration until consumed. Better methods of determining effective closures of bottles need to be developed. If water, moisture, etc. can get from the outside into the milk in the bottle, a definite health hazard will exist. The frequent hand contact will deposit bacteria of salivary or fecal origin on the external surface adjacent to the cap or hood and these bacteria will be transferred to the milk with any liquid that may gain entrance. The total bacterial count may not increase but a few bacteria per cubic centimeter but the significance of these few hundred human strains in the postpasteurized quart of milk have definite public health hazards.

There is an undeniable tendency in the public health administration of milk to retain all existing rules and add new ones from time to time. There is a tendency to pyramid regulatory measures. The bottom of the structure may be its weakest part because it is the oldest and has not been altered or revised based upon accumulation of knowledge and experience. The less inspection and regulation we can do to insure a wholesome, sanitary, and drinkable milk, the better off we are in the long run. Many of us recognize the pitfalls of over-inspection and excessive regulations. We defeat our objective when we do so. We hamstring the industry, we overload the taxpayer, and the consumers pay for a fictitious quality of product.