

THE FUTURE OF THE SANITARY CONTROL OF MILK AND MILK PRODUCTS¹

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The opportunity to take a long look ahead on developments in the official control of the sanitation of milk and milk products is welcomed. The role of prophet is a new one to me, however, I will take an engineering approach and plot the trends in various facets of the official control of milk sanitation by going back to about the beginning of the twentieth century in order to establish a basis for the extrapolation of trends perhaps as far as or into the twenty-first century. This procedure is by no means exact but is perhaps superior to that followed by the crystal gazer or charlatan. For the sake of brevity let us consider the control of the sanitation of fluid milk with the understanding that most of the discussion also applies to fluid cream and that control of pasteurization also applies to most milk products.

DAIRY FARM INSPECTION

First, let us consider dairy farm inspection. This practice originated in the days when the family physician, serving as part-time health officer, associated milk with some of the cases of disease he was attending in his urban and rural practice. It was only natural for him to stop at the dairy farm in his rounds by horse and buggy and attempt to give the part-time dairy farmer the benefit of his capable, but then not too scientific, advice on how to produce safe milk.

Thus was established the basic principle of inspection by the health authority of the community in which the milk is consumed and which has been carried down through the years. Milk sheds expanded. The part-time health officer employed a dairy farm inspector only to be replaced in later years by a full-time health officer with his staff of farm inspectors. When it became increasingly difficult to get the budget appropriations necessary to support the numerous dairy farm inspectors required to cover metropolitan milk supplies, some turned to the alternative of requiring the milk industry to provide qualified field service men whose work was subject to approval by supervising inspectors on the city payroll. This trend is likely to continue. Certainly there is no reason to



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believe that it will be checked or reversed.

In the future the task of dairy farm inspection may be modified materially by advances in equipment. The pipe line milker, the farm milk storage tank, and the farm pick-ups of milk by tank truck have come to stay. Because of labor-saving and other economies the trend will continue in that direction. Fortunately, this carries with it the promise of improved sanitation. There also is the possibility for the development of more compact dairy farms of the Los Angeles type consisting of a pen and feeding area for a hundred or more cows and a milking parlor with all breeding of cows and growing of feed being done elsewhere. If there is emphasis on dairy farm inspection, the location of a number of such dairy farms on the outskirts of the city in which the milk is consumed does simplify the problem of official inspection by such

¹Presented at the Tenth Annual Meeting of the Dairy Products Improvement Institute, Inc., Hotel Statler, New York, New York, on February 14, 1957.

city because of decreased numbers and the convenient location of such farms. However, it is quite likely that economics will govern this development rather than farm inspection requirements.

Currently there exists in the United States several different patterns of official control by cities in which work on dairy farm inspection varies, according to Dahlberg's survey (1) from zero in the case of Boston to 10.6 inspections per farm per year in the case of Birmingham, Alabama. Between these extremes we have Chicago with at least 2 dairy farm inspections a year to meet the Public Health Service Ordinance in effect there, and New York City with only a small staff of inspectors to make check inspections of dairy farms. It should be borne in mind that one farm inspection a year is made by official state health department inspectors at state expense on all dairy farms located outside the state; and that within the state, industry-employed field service men are required to make at least one inspection of each dairy farm each year. Furthermore, in Massachusetts the Department of Agriculture of the Commonwealth is required to make annual inspections of dairy farms which includes those supplying Boston with milk.

In upstate New York cream for the manufacture of ice cream is not required to be from dairy farms under official inspection; and during shortage periods, cream for all purposes has been brought into Boston without advantage of any dairy farm inspection.

In metropolitan areas, like Boston for instance, efforts to adhere to the old principle of the inspection of dairy farms by the health officials of the community in which the milk is consumed leads to multiplicity of responsibility for inspection, duplication of work, and impossible situations as to travel requirements and costs.

The conclusion is correctly drawn from the data presented by Dr. Dahlberg in his report for the National Research Council (1) that increased emphasis on dairy farm inspection is reflected slightly in the quality of the milk. However, differences in number of inspections as previously stated ranged from none or perhaps one to 10.6 per farm per year. On the other hand no claims are made for increased safety of the milk and the reported improvement in quality is very slight. If the city of New York with perhaps 0.5 official farm inspections per year were to step this up to the number made by Birmingham, or even to the minimum of 2 inspections per year required by the Public Health Service Code, many additional dairy farm inspectors would be required. In the light of present knowledge and with the facts at hand, it is not at all likely that public health officials would or could persuade budgeting authorities to appropriate funds for such increases in staff.

This leads to the prediction that the next fifty years will bring less and less official dairy farm inspection with the shifting of this burden to industry. In all industries today, including those making strictly mechanical products, there is increasing emphasis on QUALITY CONTROL with considerable expenditures to maintain staffs and laboratories for the purpose. The milk industry does this to a considerable extent at present but may anticipate increasing demands from public health officials for them to assume this responsibility. It is hoped that this will not take the form of regulations prescribing exactly what must be done, especially in the line of dairy farm inspection, but more properly what must be accomplished from the standpoint of milk quality.

ALLOCATION OF MILK

Anticipated future increases in the density of population is sure to result in further overlapping of metropolitan milk sheds beginning in the Northeast. This will lead increasingly to consideration of milk as a public utility. Of course there are more devious ways of allocating limited supplies of milk than by public decree. The establishment of Federal Marketing Areas and more general adoption of regulations encouraging the interstate shipment of fluid cream, and perhaps of 3 to 1 concentrated fluid milk, may accomplish the purpose of allocating and piecing out limited supplies of milk without establishing milk as a public utility. It is quite likely that control of increases in population will precede the exhausting of the possibility of expanding the milk supply along the lines indicated to meet demands.

SAFETY OF MILK-PASTEURIZATION

One rather simple future solution of the problem of milk sanitation would be the production of synthetic milk. This would reduce official control to that required for food processing plants. Taking into consideration present substitutes for butter and cream it would be rather audacious to say that milk never will be manufactured from organic constituents but it can safely be predicted that synthetic milk will not be commercially feasible within the next century. Continued reliance must be placed upon pasteurization to make milk and milk products safe.

Since the turn of the century, stupendous strides have been made in applying the pasteurization process to milk and in developing dependable commercial equipment for everyday use in protecting the health of millions of people. Starting with the Endicott tests, the faults of vat type pasteurizers were disclosed, inefficient types discarded, and effective equipment was

developed and used. Further cooperation between research workers in the milk industry and public health resulted in the development of safe equipment for pasteurization by the high temperature — short time process. Dahlberg's survey showed that in the eight large city markets included in the study, from 77 to 99 per cent of the cream-line milk and from 87 to 99 per cent of the homogenized milk was pasteurized by the high temperature — short time process. The increased use of high temperature pasteurization will continue and the trend toward pasteurization at still higher temperatures in such equipment as the vacreator is developing and will continue to develop gradually. This, together with the increased popularity of homogenized milk, serves to give a greater margin of safety in heat effect than is possible by the pasteurization of cream-line milk by the historic low temperature process.

In my opinion there is no prospect that the treatment of milk by radiations, whether from high speed electron accelerators or from radio-isotopes and whether of beta or gamma type, will replace pasteurization. All attempts by experimentors to sterilize milk by radiations have resulted in ruining the flavor and other physical properties of the milk due, among other things, to the difficulty in destroying the enzymes. Research is being diverted to trying to accomplish the destruction of bacteria to an extent equivalent to pasteurization instead of sterilization. While this may be accomplished it is not likely, from the standpoint of practical economy, that the process will replace pasteurization within the next half century.

What, then, does the future hold in store for control of the vital process pasteurization? As recently as 25 years ago we had to deal with the health officer of the rural community of the fringe of the metropolitan district who boasted of the quality of the highly questionable raw milk supply and refused to issue permits to the "big city" dealers to bring in safe pasteurized milk. Today there is practically unanimous agreement by health officials everywhere that pasteurization of milk is essential for the protection of the health of the public. Most of them realize the importance of maintaining official supervision over pasteurization plants and progressive milk plant operators value this service when, as is usual, it is intelligently performed. There is the danger, however, that health officials will be lulled to sleep by the absence of milk borne outbreaks of communicable disease and will listen to the appeals of the budget pruners to cut this service below all reasonable limits. The result could be equivalent to that now obtaining in some communities in which health officials, yielding to the opposition of "cranks" or to public apathy or trying to affect economies, ease their efforts at immunizing the public against some

disease that has been brought under control, and as a result the public is faced with a serious outbreak of such disease. The trend is quite sure to be in the direction of side-stepping public responsibility, either as a result of budget-pruning or otherwise, and toward depending more and more upon industry to maintain control over the safety as well as the quality of the milk sold. This applies to an even greater extent to milk products.

PACKAGING AND DISTRIBUTION

Official control over the packaging, distribution, and sale of milk has changed during the past half century and no doubt will be subject to further change. The days of so-called "curb-stone" permits, when John Smith asked the part-time village health officer, "Doc" Jones, on the street if he could sell milk and Doc said "Yes", are gone forever. Not only is it necessary to satisfy the local health official and to get a written permit from him, but generally a state agricultural official or a milk control board as well, before commencing the sale of milk. One principle that has sometimes been overlooked is that, assuming that officials are effectively enforcing regulations, if milk is safe for human consumption in one community it should be safe for 41 other communities. Another basic principle is that a health officer should deny a permit for the sale of milk only for failure of the applicant to comply with requirements of the health law and sanitary code. Taking into consideration not only these principles, but the trend toward large health units, such as county or district units, the future trend is toward fewer permits covering larger distribution areas.

Development of the packaging of milk for distribution has come a long way since the day when the dairy farmer put a can of milk with a dipper on his truck and went from door to door filling pails on doorsteps. The old heavy long necked glass bottle has been replaced by bottles of much lighter weight and more convenient shape, removing the emphasis from accentuating the cream line. More recently the single service paper container and the approved bulk milk dispenser have been accepted. In single service containers there is an observable trend from paraffin to plastic coatings. The new Swedish tetrahedron paper containers may find a place for packaging small portions of milk. However, it is more likely that coffee cream will be put up in individual servings in this container by milk plants for restaurants. Another possibility in this field is the plastic envelope with built-in spout for pouring. Much could be said in favor of two quart containers from the standpoint of economy of household refrigerator space. Availability and economics are likely to govern this trend.

After some 44 years we still have with us the old regulation requiring the placing of the day of pasteurization on the caps of bottled milk. It may be said to the credit of the state and city health officials and the Public Health Service that there is no insistence upon introducing this requirement in places where it is not in effect. Although, in some instances, health departments have favored requests from industry to rescind such requirements, attempts to do so have not met with much success. After witnessing, with Dr. Dahlberg, within the past few months, a public hearing at which an unsuccessful attempt was made to rescind such a requirement in one of our large cities, I predict that some such requirements, although becoming more and more meaningless, are likely to remain in effect for the next half century.

The home delivery of milk is another field in which there have been many changes in recent years. Every other day delivery has been replaced by deliveries three times a week in many localities. If dating were of health significance, infrequent delivery would be of greater significance, yet the change has been accomplished with little furor. It would appear that if home deliveries were made any less frequently than this that the trend would be toward purchasing all milk from stores with perhaps an accompanying decrease in total per capita milk consumption.

LABORATORY CONTROL

Much progress has been made but there is room for still greater progress in the laboratory control of milk supplies. Again going back to the early nineteen-hundreds much dependence was placed upon standard plate counts made by a very unreliable technic. Health officers were concerned about the use of the "farm pump" to augment the milk supply and also of butter-fat content largely because of consumer interest. As milk quality improved, less use was made of the lactometer and butter fat test, and, as the pasteurization of milk became more general, the usefulness of the standard plate count diminished. The work of Breed and others to improve the reliability of the standard plate count through the amendment of the *Standard Methods* of the American Public Health Association helped restore confidence in its usefulness for some purposes. However, when health officials became convinced that commercial pasteurization of milk offered adequate protection to the public health, much interest was displayed in the development of a test that would tell them whether or not milk had been adequately heat treated. The phosphatase test filled this need and rapidly came into general use. No doubt it is here to stay both in field and laboratory

applications and will increase in usefulness as experience develops.

The advantages of the coliform test for the examination of pasteurized milk and milk products should not be overlooked. Properly pasteurized milk should not contain organisms of the coliform group notwithstanding the efforts of some sanitarians to explain them away. Even they should agree that coliforms should not be present to the extent of 1 per ml. which concentration is indicated when the coliform plate count is used. Some well-regulated plants operate around the calendar without a positive coliform test. This is not in criticism of the commonly used minimum standard of not more than 10 per ml. which is quite useful under present conditions. However, high quality milk should show much lower coliform counts and the future trend should be in that direction. We may anticipate a simpler test for coliform organisms in milk that may be used by small milk dealers and rural health departments with no more extensive equipment than a very small 35° C. incubator. A German invented this test two or three years ago and has applied for U. S. Patents. Material for performing the test now is on sale by a Swiss concern, namely BACTO-STRIP A. G. in Zurich. A dry sterilized paper strip containing the required media and dye is supplied in a plio-film envelope. The strip is carefully withdrawn from the envelope after cutting the end and absorbs just 1 ml. of the milk to be tested when dipped in the sample. The perforated end of the strip contaminated by the fingers is torn off and discarded as the wet strip is returned to the envelope which is resealed by heat. It is then placed in an incubator at 35° C. for just 10 hours (no more) and then the minute bright red dots are counted giving an estimate equivalent to a coliform plate count of the number of coliform organisms per ml. of milk. The very limited amount of work done in our laboratories with sample strips leads me to believe that it has good possibilities at least for the previously mentioned uses. This leads to the prediction of further development of convenient laboratory methods during the next fifty years.

Little, if any, attention has been paid to determining what constitutes a representative sample of a large daily output of pasteurized milk. This deserves study and the next half century should see the introduction of methods of sampling that will be more representative than the taking of a random quart from supplies totaling thousands of quarts daily.

INTEREST OF HEALTH OFFICER

Finally, let us consider the attitude of health officials toward the control of milk and milk products. This is still of some importance even though budget di-

rectors appear to be exerting ever greater influence on the direction of effort in health programs. At the turn of the century health officials were mostly part-time physicians. They were practically unanimous in proclaiming cow's milk and its products as excellent food for humans, even though it was then unpasteurized; and the more progressive ones knew that in many instances its consumption was causing sickness and death. Some even went so far as to characterize milk as "nature's most nearly perfect food". As the years progressed the milk industry with the cooperation of the leaders in public health, through the introduction and improvement of pasteurization and other control procedures, eliminated milk as a medium for spreading such common diseases as tuberculosis, typhoid fever, and streptococcal sore throat.

About two decades ago when this point had been reached in New York State my complacency was jarred by an eminent health official suggesting that now the emphasis on control of milk sanitation might be re-directed and adding that he was not even sure that milk was a good food for humans.

Quite recently some of the news media have taken "pot shots" at milk by reporting that some investigators feel that milk may play a role in stimulating cancer, that excessive milk fat may cause heart disease, and that the radio isotope strontium 90 in milk may accumulate in the bone marrow. Perhaps an equally searching inquisition of other foods would bring similar results. We also should bear in mind that the human body requires certain trace elements which

would be toxic, however, in much greater quantity. Of course, the milk industry is faced with the need for sponsoring research designed to separate fact and fiction.

To my thinking the raising of these doubts is not an unmixed evil as it may serve to create a renewed interest in milk and milk sanitation on the part of those health officials who now can think only in terms of devastating diseases such as cancer and heart disease.

SUMMARY

It is quite certain that under the lash of budget control there will be an increasing tendency for health officials to saddle the milk industry with as much as possible of the responsibility for maintaining the safety as well as the quality of public milk supplies. More and more the public will look to the milk dealer for a warranty as to the quality and safety not only of milk products but of market milk as well. However, some well directed official control of milk sanitation always will be necessary and no doubt will be available during the next fifty years or more notwithstanding efforts to direct official activity elsewhere.

REFERENCES

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