CHANGES IN MILK SANITATION IN THE PAST TWENTY YEARS

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Twenty years is a relatively short period. Except in a few States, those born in 1937 cannot yet vote. In political history, there have been only two changes in National administration since 1937. With respect to Milk Sanitation, the past twenty-year period represents slightly less than one-third of its life-span to date, which may be said to have begun about 1892. Since the International Association of Milk and Food Sanitarians is now forty-six years of age, the twenty years of Journal of Milk and Food Technology publication cover less than half of its life-span to date.

Although most of the pioneers in Milk Sanitation, and many of the leaders during the 1930's, have passed from the scene, quite a number of currently active milk sanitarians have a personal recollection of conditions in effect and practices followed prior to 1937. These latter, without doubt, realize and recognize that developments in milk production, transportation, and processing, as well as in bacteriological laboratory techniques and milk-handling equipment design, have brought about changes in milk sanitation practice; but some of these changes have been gradual, and their extent and significance may not be fully recognized by those not directly involved.

To those recruited into milk sanitation within the past three to five years, 1937 may appear to have been an eon ago—at least the "horse-and-buggy era" of the profession. A review of the Tables of Contents of the seven numbers of Volume 1 of the Journal, 1938, (including the initial October, 1937, Convention Number) will shatter any such erroneous concept, and will serve to provide a base with which to compare the Tables of Contents of the 1957 numbers.

Papers on the following subjects, roughly organized into categories, appeared in Volume 1, 1938:

- Bactericidal Treatment of Farm Utensils
- Bacteriological Procedures—Comparison of culture media—Resazurin test
- Bovine Disease—Tests for mastitis
- Certification of Milk Laboratories
- Homogenization
- Milk-Borne Disease—Undulant fever
- Milk Containers—Glass bottle pouring lip—Paper cartons
- Milk Legislation in small communities
- Pasteurization—HTST—Phosphatase test—Re-contamination of pasteurized milk
- Quality Control—Platform tests vs. farm inspections
- Off-the-bottom sediment tests
- 3-A Sanitary Standards

The physical limitations to the number of papers which could be published in seven numbers of the 1938 format of the Journal also limited the range of subjects covered. Even though it covers only a small number of the aspects of the subject, as conceived in 1938, the foregoing outline makes it apparent that milk sanitation had emerged to a marked extent from the era of emphasis on the control of skimming and watering of milk, on the feeding of brewery and distillery wastes, and on the dipping of milk from cans and filling the containers of customers in milk depots.

In a review of the changes which have occurred in twenty years, a distinction should be drawn between the whole subject of milk sanitation and milk quality control practice. It is in the latter specific phase of milk sanitation that fieldmen, regulatory sanitarians, milk quality control administrators, and laboratory technicians function. Consequently, in spite of the text of the title, this paper will deal primarily with changes noted in milk quality control practice and coverage.

Incidentally, it is a fallacy to consider milk quality control as an entity consisting of a uniform degree of advancement and effectiveness in all jurisdictions at any selected time. Modernization of milk production methods, and of milk transport, the volume of milk pasteurized and the technique of pasteurization, herd management, cattle housing and feeding practices, insect infestation, and even some laboratory procedures, vary through considerable ranges in different geographical areas. In some instances climate is the determining factor in differences; in older urban milk sheds, production customs and traditions or long-established statutory considerations hold milk quality control practice in patterns difficult to adjust to modernization in processing and distribution. Consequently, this enumeration of changes in milk quality control practice, which have occurred during the last two decades, applies specifically neither to all milk sheds nor to any specific one.

Milk quality control consists of a number of distinct...
activities, some of which are conducted by others than fieldmen and regulatory sanitarians, producers, milk haulers, and plant personnel and managements. These others include veterinarians, dairy extension specialists, field agents of cattle breed associations, and sales representatives of manufacturers of production and processing equipment, and of sanitation supplies. Therefore, in the enumeration and discussion of changes which have occurred in milk quality control practice — or which are imminent — reference must necessarily be made to aspects or phases other than those in which fieldmen and regulatory sanitarians personally engage.

**Bovine Disease Control**

Bovine tuberculosis had virtually been eliminated by the close of 1937. It was officially declared to be eliminated by December 31, 1942. Elimination of brucellosis is not so far advanced; but the ring test and calf-hood vaccination hold much promise. Since much regulatory practice entails the testing of herds at specified intervals, the discontinuation of area-testing has intensified the pressure for the maintenance of complete test records in the files, and has placed upon the production field personnel the responsibility for obtaining such records.

Mastitis was discussed in Volume I of the Journal, and one or more aspects of this problem have been discussed in nearly all of the volumes published since. Control of the incidence of mastitis has virtually been restricted to the treatment of recognized cases. Difficulties encountered in the manufacture of fermented products with milk from herds in which animals are being treated with antibiotics constitute an industry problem; but the potentiality that consumers of milk containing measurable quantities of antibiotic may become sensitized and react adversely to needed dosages of antibiotic, presents a problem in public health. Lacking a rapid test for the presence of antibiotics in milk, sanitarians are at present seriously handicapped in controlling acceptance of milk containing them. But such control is an activity which may have to be undertaken in the future.

**Herb Management**

This is an aspect of milk sanitation which is distinct from milk quality control, but one in which fieldmen and dairy extension specialists exert much influence. It is evidenced in such voluntarily adopted practices as managed milking, controlled feeding (to avoid off-flavors), withholding of milk for six milkings after antibiotic medication, loose-housing, the installation of a bulk milk cooling tank, or of a pipeline milker, etc. The practices named (except loose-housing) may be assumed to lighten the load of regulatory sanitarians; but the installations impose upon both fieldmen and regulatory sanitarians the responsibility of assuring that the equipment conforms to pertinent 3-A Sanitary Standards, that it is installed so as to facilitate optimum functioning, and that the user is instructed in its operation, cleaning and maintenance.

Most of such supervisory and instructional services—sometimes including calibration of bulk cooling tank measuring devices — are customarily rendered by fieldmen; with regulatory personnel making the final inspection. It must be conceded, however, that the cleaning and bactericidal treatment of bulk milk cooling tanks and milker pipelines is an undertaking of somewhat greater magnitude, and in the latter instance also more complicated, than the manual washing, racking, and disinfection of pails, strainers, etc.; and that when these types of equipment are not effectively cleaned and disinfected, all of the milk passes through or into them and is adversely affected. Avoidance of wide fluctuations in milk quality is assured only by a step-up in the frequency of inspection of farms at which installations of these types of equipment have been made.

**Laboratory**

In a limited number of instances, milk sanitarians make bacterial examinations of the milk samples they collect; in some other instances, industry quality control activities are vested in the director of the plant laboratory. Because the determination of bacterial content and chemical composition is so closely integrated with field inspection activities, it is appropriate to review some changes in laboratory activities occasioned by developments during the past twenty years.

Twice since 1937 "Standard Methods for the Examination of Dairy Products" has prescribed modifications of the agar medium used in making plate counts. These improved media have made colonies of thermophilic bacteria (resistant to pasteurization) countable after incubation for 48 hours, and have, in many instances, necessitated the laboratory pasteurization of milk supplies prior to plating, in order to identify those to be kept out of the supply for pasteurization.

Improvement of the phosphatase test procedure between 1936 and 1941, and subsequent shortening of the procedure, has made this test of pasteurized milk samples practically routine. General acceptance of the destruction of practically all strains of coliforms by pasteurization has established the coliform count as...
a measure of post-pasteurization contamination, and has made this a routine procedure in many laboratories.

The increased frequency with which other determinations—such as those for the presence of water and other adulterant additives, rinse and swab counts, assays of the effectiveness of detergents and bactericides etc. are made varies with local circumstances and needs.

Routine Milk Quality Control Field Activities

A comparison of milk plant and dairy farm inspection report forms of 1937 and 1957 reveals no striking reduction in the number of items of sanitation covered. The changes in inspection coverage and field activities, (not necessarily covered by inspection report times, but usually set forth in instructions and directives) consist primarily of activities augmenting or in addition to those which are regarded as conventional. It might logically be stated there has been an expansion of conventional inspection and other quality control field activities.

In milk plants it has become routine, at fixed intervals, to determine the holding-time of HTST pasteurizers, the time-lag of the flow-diversion valve, the accuracy of thermometers, the effectiveness of leak-protector valves, milk temperatures at cut-in and cut-out pump-stop times, the thermometric laf of the recorder-controller, etc. In plants in which cleaning-in-place is practiced, charts of detergent solution temperature and period of circulation are to be checked, and fittings or parts periodically are to be disassembled for inspection or swabbing. In plants which service manually-operated bulk milk dispensers or coin-operated bulk milk venders, the washing, bactericidal treatment, assembly, and filling of the cans in which pasteurized milk is supplied to the dispensers and venders necessitate additional and possibly intensified inspection activity.

The widespread interest in extraneous matter in milk during the middle and late 1940's induced a surge in off-the-bottom-of-the-can sediment testing, with standardized evaluation of sediment discs, and organized filing of discs or their return to producers. The shift to transportation of milk in bulk has eliminated this, as well as other platform tests, in many areas. But those sanitarians who have thus been relieved of the need to make off-the-bottom-of-the-can sediment tests may shortly find that the sediment tester has become an item of standard equipment, to be used for determining the amount of extraneous matter in the milk in farm cooling tanks.

Installations of bulk milk cooling tanks and of milker pipeline systems—milking parlor or stanchion barn—have more recently imposed rather specialized additional activities upon milk sanitarians assigned to production. The cleaning of these types of equipment entails techniques quite different from that customarily followed in the manual washing of small, easily-manipulated utensils. The knowledge that the cleaning of these types of equipment is not universally and consistently effective is neither exclusive nor restricted. Consequently, some of the dairy farms on which cooling tanks and milker pipelines are in use may, at least for intervals of varied duration, require closer and more frequent inspection than was the practice prior to the installation of the equipment.

The washing and bactericidal treatment of bulk milk tanks and milker pipelines requires more water than was needed to wash and disinfect the smaller equipment previously used. (The milk cans were generally washed at the milk plant or receiving station.) This need for more water may exceed the capacities of some sources of supply, making more frequent determinations of bacterial content, or surveys of proposed additional sources, advisable. Furthermore, disposal of the increased quantity of waste water may also develop situations to which attention must be devoted.

The shift to relay milking in milking parlors—or in pipeline equipped conventional barns—generally leads eventually to the practice of loose-housing of the cows. This differs from the corral penning of herds on the Pacific Coast and in the Southwest, and from the pasturing of the herd between milkings in the South, only to the extent that the enclosure is walled (at least on three sides) and roofed, to provide protection against the weather. The concentration of animals in a limited area, and the handicap to removal and disposal of manure presented by climate during a portion of each year, produce problems in maintenance. Maintenance of sanitation is quite feasible; but control necessitates more intensive supervision.

The growing list of types of dairy equipment covering which 3-A Sanitary Standards have been formulated, and the policy of most regulatory agencies that only equipment which conforms to pertinent 3-A Sanitary Standards be permitted to be installed, confronts regulatory sanitarians and fieldmen and plant management with the obligation to determine whether equipment does conform. The appearance of the 3-A symbol on equipment eliminates the need for a complete check of sanitation features of each item of equipment, after the first of the type and model have been checked. Nevertheless, it is advisable to make observations of construction and finish of all new equipment installed. (Non-conformance of equipment to which the 3-A
symbol is affixed should be reported to the 3-A Sanitary Standards Symbol Administrative Council.)

**Milk Quality Control Administration**

Developments since 1945 have presented administrators of milk quality control programs with a number of problems, the nature of which could not even be visualized in 1937. Consequently, there was no precedent for the disposition of some of these questions when they arose. Decisions, predicated upon statute, ordinance, or regulation, had to be reached concerning such questions as the permissive use of detergent-sanitizers, the use of detergents and bactericides the active components of which were chemical entities previously unknown in the dairy industry, the cleaning-in-place of milk plant piping and equipment (and milker pipelines), and, in at least one instance, the introduction of bulk milk cooling of dairy farms. Whatever the nature of the decisions reached, procedures for their applications had to be devised and implemented.

It is not the objective of this paper to discuss in detail the various procedures and programs which have had to be evolved to meet developments. Whatever their nature, they represent changes, at the milk quality control administration level, which have occurred since 1937.

In order to implement certain of these procedures or programs, in-service instruction of staff personnel has had to be provided. This in itself, marks a decided change.

The organization of the Conference on Interstate Shipments of Milk, and the system developed for determining the sanitation rating of milk supplies, has imposed upon administrative regulatory sanitarians of exporting States responsibilities and activities they were not formerly called upon to assume and provide.

Inadequacy of personnel and funds to provide all of the services which regulatory organizations are obligated by statute, ordinance, or regulation to render is not a situation which was unknown prior to 1937. However, with costs increasing as they have during the last twenty years, and appropriations failing to keep abreast, it is obvious from the foregoing enumeration of added services, that inadequacies of personnel and funds are being intensified by the assumption or imposition of new services. For instance, the shift from transportation of milk from farms in cans to transport in bulk is rapidly making it no longer possible to determine the quality of a considerable number of supplies, at the plant platform, in a single morning. The sampling of the same supplies, now possible only by visiting each farm, in the same period, would necessitate a vastly increased personnel, and an increase in travel funds.

Probably the most notable change, at the administrative level of milk quality control, which to some extent has already taken place and which will undoubtedly increase in the early future, is the extension of the policy of deputizing haulers to take official milk samples, and, possibly, of registered fieldmen to make routine dairy farm inspections.

If there is a conclusion to be drawn from the foregoing enumeration, which is admittedly incomplete, of changes in milk quality control activities necessitated by developments normally to be expected in a highly competitive industry, it is that the era during which individuals without specialized training could readily be converted into milk sanitarians has passed. Not only must administrators of quality control programs be prepared to cope with technological matters, but those to whom the execution of organized programs is delegated must also be able to act with judgment based on knowledge when circumstances require. Preparatory schooling is the prescription for that object.