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(1) Standard Methods for the Examination of Dairy Products, ed. 10, New York, American Public Health Association, 1953. (2) Committee Report, Am. J. Pub. Health **42**:1131 (Sept.) 1952. (3) Microbiological Methods, report at 66th Ann. Meet. Assn. Official Agricultural Chemists, Sept. 29, 1952: J. Assn. Official Agr. Chem. **36**:91 (Feb.) 1953. (4) Standard Methods for Examination of Water, Sewage and Industrial Wastes, ed. 10, New York, American Public Health Association, 1955.

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EDITORIAL OFFICES: J. C. Olson, Jr., Associate Editor, Dept. Dairy Husbandry, University of Minn., St. Paul, Minn.; H. L. Thomasson, Managing Editor, P. O. Box 437, Shelbyville, Ind.

Manuscripts: Correspondence regarding manuscripts and other reading material should be addressed to J. C. Olson, Jr., Associate Editor, Dept. Dairy Husbandry, University of Minn., St. Paul, Minn.

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MAN'S CHANGED ENVIRONMENT—PUBLIC HEALTH IMPLICATIONS [1]

MARK D. HOLLIS [2]

Public Health Service,

U. S. Department of Health, Education and Welfare

Washington, D. C.

In the past, environmental health practice has, for the most part, been geared to the control of living agents of disease. It was justly so because our pressing problems were those associated with the spread of communicable diseases. As the nation started its slow transition from an agricultural to an industrial economy, the population shifted from farm to city and brought with it an increasing need for public water supplies which were ample and safe. Sanitary engineering techniques of water purification and sewage treatment moved with the times. This history you know—it's a bright history and one we are proud of.

The control of insect vectors of disease also came within the scope of sanitation practice, and techniques were slowly and tediously developed to combat malaria, yellow fever, plague, and endemic typhus.

With the growth in the urban population came more complex problems in milk and food supply, and certainly these you know. Banishment of the family cow and the abandonment of home preservation of food shifted the responsibility for the safety of these products from the individual to the community. Sanitation practice was, therefore, broadened, and measures were developed and applied to control the spread of disease through milk, shellfish and other foods.

As we approached mid-century, sanitation practice was at a crest. Control procedures had been worked out for most of our problems, and we could enjoy the luxury of refining proven techniques to obtain more effective and economical ways of doing a job we now seemingly so well understood. In our traditional areas of responsibility—water, milk, food, vector control, and sewage treatment— we knew what to do and how to do it. True, there were gaps in our knowledge that still required research, and some of our programs appeared to need further development of techniques, as is still the case, but by and large, our essential needs were resources and public support to get the job done.

About mid-century began a rude awakening. Problems were changing and they were changing at an accelerating pace. Problems were emerging that differed in magnitude and in nature from those of the past, and these could not be resolved with existing methodology and concepts. The origins of these striking changes were, obviously the explosive population expansion in metropolitan centers, and the rapid pace of scientific discovery and technological change.

In 1900 the population of the United States was 75,000,000, two-thirds of which were on farms. In 1950, the population had doubled and shifted. By then, two-thirds were in cities. Today, the population is above 172,000,000 with more than 100,000,000 living in metropolitan centers, and our population experts forecast that, in 20 years, we will have an additional 50,000,000 Americans, with three out of every four persons living in metropolitan areas.

Forty years ago there were less than 50 metropolitan areas; today there are 174. These embrace some 16,000 local governments with more in sight, since suburbs are growing at six times the rate of the cities. Each of these local jurisdictions has its autonomy and prerogatives which result in a maze of complications in dealing with environmental health problems. The water supply is not coterminous with the sewage authority, which, in turn, is not coterminous with the air pollution authority, and the milk and food supply is shared and inspected by a varying number of jurisdictions.

Even more striking is the growth in industry. Within the short period of 50 years, more technological changes have occurred than in the previous 2,000 years. Most of us here today have witnessed the gasoline engine supplant the beast of burden, and the other vast changes in transportation and communications. We may be impressed with the 900 per cent increase in industrial production since 1900. But it is more remarkable that more than half of this increase has occurred since 1940.

The impact of this expansion on our economy and standard of living is reasonably apparent. The consequence of much of this on environmental factors is not so readily observed and as yet, is less clearly defined and understood.

The key word in this dynamic age of science and

[1] Presented at the 45th Annual Meeting of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, Inc., New York City, September 8-11, 1958.

[2] Assistant Surgeon General, Public Health Service, U. S. Department of Health, Education, and Welfare.

technology is "change", but it is not the fact of change that is so significant. It is the pace of change. Industry continues its magnificent job of combining the research product of the basic scientists with the Twentieth Century art of modern technology. For example, in the chemical industry, synthetics—almost unknown in 1930—are now commonplace. Nearly a million of these compounds are in production and in use in construction, in household products, in clothing, and in foods. And now, we are seeing the field of nuclear energy unfold—the atomic age—with its gigantic potentials for both constructive and destructive use. The lag between basic discovery and industrial application continues to diminish, and we have an ever-increasing expansion in new substances, new products, new uses, and, unfortunately, new pollution.

The accelerated pace of population expansion and industrial development is already putting stress on basic resources. If we look about we can see situations where time is running out. In many areas, shortage of water is threatening further expansion, and other areas are approaching the limit of their air supply to absorb the waste products of their industry.

The nation's water resource is now a problem of top priority. The water problem is one of increasing demands, seasonal shortages, floods and pollution, or more simply—too much or too little or too bad. At present, the urban dweller averages 150 gallons of water use per day. Forty years ago, the average was about one-third that amount. The water that goes into production of things you eat and wear and use raises the national per capita requirement to above 1,500 gallons per day. For most metropolitan centers, water supply is a pressing problem. The relationship between metropolitan water supplies and water pollution grows even closer. Water pollution is more than a waste; its control has become essential to the need for repeated reuse of streams as they flow from city to city.

The problem is not limited to adequacy of supply; there are health implications as well. While population densities are still, in most areas, below the point where bacterial quality of raw water to be treated is seriously endangered, a projection of population and industrial trends over a decade or two have a sobering effect. One might predict with sound argument that, in time, and perhaps not so far off, public water supply will again be a major public health concern in the nation.

With respect to air contamination, the situation must be faced that the community air supply, too, has finite limits and that dilution alone will not always dispose of the increasing variety of stack wastes. While we must frankly admit that we do not as yet know the specific physiological damage that may be caused or accentuated by air pollution, we cannot afford to dismiss the episodes at Donora, Pennsylvania, in 1948, and at London, in 1952, as freak incidents. Today, every metropolitan area has air pollution problems of varying magnitude. For most cities, the situation will grow worse before practical remedial measures are worked out.

The impact of the changing environment is also reflected in the nation's food supply. Here, it is reassuring to find that our colleagues in agriculture forecast no food shortage in the foreseeable future. This in itself is an example of the complex interplay of the opposing forces in the present era of population expansion and advancing science and technology.

One would expect agriculture to be hard pressed to keep pace with the expanding population in an era when people are migrating to metropolitan centers and large tracts of farm land are being diverted into suburban developments. Yet, these factors have been offset by the effects of science and technology. Research has provided new techniques of cultivation and management as well as new strains and varieties of plants and animals, all of which have greatly increased agricultural productivity. The far-reaching effect of technology is illustrated in the substitution of the truck and tractor for the horse and mule. It has not only speeded up many farming operations, but has also released some 70,000,000 acres of cropland to the production of agricultural commodities for human use—an area approximating that of New York, Pennsylvania, and New Jersey.

The most important health implication of our modern age on the food supply is, perhaps, our increasing dependence on chemicals. We use fertilizers, hormones, antibiotics, herbicides, germicides, fungicides and pesticides. Some of these, although beneficial through their contribution to agricultural productivity, are poisons and as such, a potential threat to human health. It is not possible to evaluate this threat in the same terms as the communicable diseases which, by virtue of their explosive nature, lend themselves readily to statistical assessment. With chemicals, we are concerned not just with the acute reactions but also with the effects of low-level chronic exposures encountered through food, water, and other sources.

The atomic age introduces new problems, new terms and new dimensions. Radioactive contamination does not follow established formulas of dispersion, dilution and biochemical actions. It requires assessment in the light of the health significance of very small quantities of materials and their indestructability. For this reason, we are interested in the amounts of radiation being introduced into the environment from all sources—natural, fallout, X-ray, and commercial use. With nuclear power plants now a reality, with atomic powered submarines in use, and with other applications on the way, there is need to step up substantially the public health activity in this important field.

The nature of these problems emphasizes a need for a coordinated approach in environmental health; perhaps a need to attack certain problems on a multi-disciplinary categorical basis. At least, we must have free interchange of information among those responsible for control of specific segments of environmental health and among those responsible for local areas. With a potential for widespread dispersion of chemical and radioactive contamination, the resulting health problems are not isolated in compartments of programs or jurisdictions. There is a quantitative aspect to these problems, and we must know the total exposure from all sources to evaluate properly the effects of amounts received through a single channel.

Present concentrations of chemical and radioactive contaminants are still low. Authorities, for the most part, are agreed that such contamination is not as yet a major health hazard. However, when we project trends—keeping in mind that technology is accelerating—the indicated concentrations of contaminants in air, water, and food, even a short ten years hence, have sobering implications.

We in public health must be realists and promptly face up to the task of working out technical and administrative procedures to assist in orderly progress and to safeguard public health. We must anticipate our problems and define our research needs in order to keep apace with new developments.

The public health implications of this age of change is not limited to the emergence of new pollutants. Population growth and shift, and technology have also accentuated many existing problems and complicated our programs of control. In this regard, we must accept the fact that the techniques of yesterday may not fit our current problems, and we must be ready to explore possibilities of doing a job by different means.

In the past decade, you have witnessed revolutionary changes in the milk industry. Once characterized by small enterprises each with local areas of procurement and distribution, the size of pasteurization plants has increased and the number decreased, and their procurement and distribution areas have broadened proportionally. On the technical side, there have been the advent of the combine milker, the farm tank, bulk pick-up, new pasteurization processes, new methods of packaging and distribution, and now automation with its substitution of tanks, pumps and vacuum tubes for the scrub brush in cleaning of milk equipment.

These changes have required adjustment and reorientation of control procedures and have pointed up the need for greater uniformity of requirements and reciprocity of inspection among jurisdictions. Your Association can be proud of its role and the role its committees have played in analyzing these developments. In cooperation with other health groups and industry, the committees are working out standards and procedures which accept progress and preserve public health protection.

With food, the changes have been equally significant. One has only to walk down the aisles of any supermarket to gain an appreciation of the value of these changes to the American consumer. Perishable foods—once available only during harvest season or in a particular locality—now may be had at all seasons of the year by every housewife, and the ever-increasing variety of precooked frozen foods and other prepared foods are removing much of the drudgery from home meal preparation. The trend is toward convenience. This is, perhaps, best illustrated by the tremendous growth in automatic merchandising. The dollar volume of merchandise sold through vending machines (about half of which is food and beverages) now exceeds two billion dollars annually—a four-fold increase in the past ten years. Back of these trends are a host of changes in food technology and, as in the case of milk, your Association is to be commended for its cooperative work in developing safe procedures and standards.

These cooperative programs are in accord with present-day needs. The free give and take among representatives of health agencies and industry at working conferences of the 3-A Sanitary Standards groups and the National Sanitation Foundation not only provide practical solutions to equipment problems, but also contribute to the mutual understanding of viewpoints that is so necessary in this age of change.

I would also like to comment on another important activity of your Association—your work on the professional development of the sanitarian. Considering the importance of his work and contributions to better health, universal professional recognition is long overdue. Your work and that of other sanitarian organizations have done much to enhance the status of the sanitarian. The formation of the Sanitarians' Joint Council in which your Association, the National Association of Sanitarians, and the American Public Health Association all participate, is another forward step. It can prevent the wastes and tragedies that have occurred with other professions who did not provide a forum where organizations having parallel interests could meet and agree on one program with consolidated support.

In developing your program I would suggest that you not limit your thinking to the traditional and established activities of the sanitarian. There is need for new skills and competencies to cope with coming problems. The stature of sanitarians will be increased if these can be supplied from his category.

In closing, I would like to emphasize the significance of change and the pace of change on the future course of environmental health. Our old ally Time is diminishing by geometric proportions. It is no longer possible to probe and explore every facet of a problem or to proceed through sequential steps of research, development of control procedures, and ultimately implementation of a program. Rather, these steps must be merged into a coordinated, concurrent activity with initial control measures based on the best judgment of a trained profession. In this setting, research becomes even more important and must be an integral part of programs of control.

Anticipation and mobility will be key words in dealing with our future problems. Anticipation in the sense of sifting new developments for hazards, and building in health protection where it is needed. Mobility in the sense of being able to progress with the times, in order that our programs may be in keeping with the current situation.

Your Association, with its fine record of constructive action will, I am sure, continue to make significant contributions to the solution of our new problems.

THE INTEGRATION OF INDUSTRIAL SANITATION [1]

J. LLOYD BARRON [2]

National Biscuit Company, New York

Industrial sanitation, in its broad concept, means the physical maintenance of the work place, not just in manufacturing plants, but in every place outside the home where people are assembled in numbers for a multitude of purposes—business, travel, education, worship, national defense, entertainment, health, even detention. It is, therefore, a factor as big as industry and business and all our sociological activities. It accommodates a high percentage of the 65,000,000 persons employed in this country, and many millions more who receive the services of the employed.

The Institute of Sanitation Management is proud of its unique position and its opportunities in undertaking to represent this function, this service, and the people engaged in it. Yet admittedly, the function—industrial sanitation—is just beginning to be recognized for what it is—a vital element in the producing of goods and the providing of services, economically significant, bearing on human health and well-being, and engaging the thought and energy of millions of persons in this country.

ISM REPRESENTS SOMETHING NEW

Few of us here have been long engaged in this work; it is just emerging as a recognized management job and it is regrettable fact that the top industrial executives and the management experts who have thought with any real perception about industrial sanitation are distinctly in the minority. Is it any wonder, then, that industrial sanitation appears, in some instances, to be an unstable function? To be more explicit, why in some industrial corporations and in some manufacturing plants is there too frequent turnover of supervision and a tentative, rather ill-defined approach to industrial sanitation? The answer probably lies in three circumstances: (*a*) the company management doesn't clearly comprehend the meaning and place of industrial sanitation in the plant organization and operation; (*b*) the management personnel assigned to the function do not fully understand the job nor have adequate supervisory and technical backgrounds for its handling; and (*c*) a combination of the above factors, leading to a failure to separate the function and then to make it an integral part of the plant operation.

When we look at the roster of members and their affiliations represented in the Institute of Sanitation Management, we see an imposing array of well-known corporate names. Obviously, the function of industrial sanitation has had some degree of recognition and acceptance in each of these operations, but in how many corporation and major manufacturing plants is it established as distinct, and recognized as indispensible? I would like to explore with you some of the reasons for this situation and some of the ways by which industrial sanitation can become properly integrated.

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[1] Presented before the Institute of Sanitation Management, New York, November 3, 1958.

[2] President, The Institute of Sanitation Management.

Separation Before Integration

Integration is a word currently stirring some strong reactions in our society, but here we use it in its simplest connotation—fitting one part into other parts to make a smoothly operating whole. However, a condition necessarily preceding integration, or coincident with it, is separation. Integration of the amorphous or the ill-defined is pretty difficult. If we are to integrate industrial sanitation in the plant operation, it must be recognized, at least in its basic purpose and outline, by those responsible for plant administration.

There is no problem in seeing production for what it is whether in a factory making automobiles or pretzels, or on a railroad selling transportation; there is also no difficulty in perceiving mechanical maintenance of machines and of power, fuel, light and heat in the work place as a basic function. But what of the work place itself? Is it a part of production, or of machine maintenance to keep a plant clean, in order, and safe? Or is it a third, parallel function—industrial sanitation—which should relieve production and mechanical maintenance of a distinctly different set of tasks and deal with them as its prime function, with consistency and efficiency.

Some degree of maintenance of the work environment is essential to avoid fouling the work place beyond use. Unenlightened top management may hang a part of this maintenance on production, some of it on mechanical maintenance, and leave a part floating, but this may not involve any particular decisions or planning but more likely an unthinking following of past patterns. Management may be jolted out of such folly by one or a combination of adverse consequences such as product quality damaged by plant soil, or a bad safety or industrial hygiene situation, or low employee morale or union protests caused by low grade working conditions and personnel facilities, or by pressures of official agencies, or in some cases by inside or outside efficiency surveys to discover what's wrong and wasteful in plant operation.

Whatever the cause or condition, a major improvement is available to any corporate or plant management that will first recognize and separate what is industrial sanitation from the other plant functions, and then integrate it into plant operation under competent supervision. But I venture to say that there are a good many plant managements which have caught a glimpse of this procedure, have tried to isolate this maintenance function and give it separate management—and have apparently failed to get results, whereupon they have relapsed back into the old slipshod ways.

This audience is actually but a small fraction of those who have been called upon by plant executives in recent years to assume some responsibility for industrial sanitation—and who have been unable to deliver. The fact that we are here is an indication that, in some measure, we have risen to the challenge of this job—and that we have justified some decisions of management both in the matter of organization and in the selection of personnel.

Management Needs Guidance

These management decisions grow out of the sheer logic or the desparateness of the situation, or they are motivated by outside pressures (such as that of the Food & Drug Administration in the food, beverage and pharmaceutical industries), or one executive learns from another that there are many diverse plant tasks that can be grouped and supervised in a single operating unit so as to raise the efficiency of the whole operation.

I regret to say that the executive will not get much guidance in this particular problem from the big management associations. These in spite of their elaborate seminars and training courses have until now failed to grasp the meaning of industrial sanitation or to realize that it requires separation, analysis and managed integration to secure its real potential of efficient service. This myopia among management experts stems largely from their experience in the large industrial operations where the products are machines, or tools, or mechanical parts, or chemical products. Here the production supervision is essentially engineering; the distinctions between engineer-supervised production and engineer-supervised mechanical maintenance may be clear, but the actual differentiation of the work environment maintenance may be so far down the line that it is below the point of effective coordination. If it is below the point of coordination, it is too low for the needed quality of supervision, or for representation at the proper level of plant management. Industrial sanitation is too vital and too far-reaching in its over-all effects upon production and on plant labor for its parts to be dispersed and subordinated to other functions.

In many of our large heavy industry operations, industrial engineers and efficiency experts are at work analyzing not only production practices and production machinery maintenance, but also the tasks that make up the maintenance of the work environment. Too often, they study the parts and perhaps make some imporvements, but without ever putting all these parts into context as industrial sanitation so as to realize the fundamental advantage of unified supervision.

It has not been so easy for the food industry to ignore the logical approach to industrial sanitation. Food quality is dependent in varying degrees on plant sanitation. Official agencies maintain surveillance and occasionally resort to prosecutions to force an interest in sanitary processing and protection of foods. Yet, it is a sad fact that there are thousands of food manufacturing plants and food sales companies in this country in which the word "sanitation" is not to be found in a supervisory job title or applied to a plant function. We have just witnessed the disappearance of a firm from the dried fruit industry which was once its largest single unit; the management that presided over its decline and fall gave as little attention to sanitation as possible, in spite of official prosecutions. The major food processing company or the supplier of major ingredients of food processing which has no visible indication of the sanitation function in its management personnel and organization chart is at least suspect of either ignorance or irresponsibility.

Quality Control Not Industrial Sanitation

Let me say at this point that the quality control function to be found in many companies and perhaps manifested in elaborate laboratory and research facilities and quite competent personnel is no equivalent or substitute for the sanitation function. Any company executive who thinks so has never examined the problem. In fact, one of the most serious and often made mistakes in trying to set up a sanitation function is to place its supervisory personnel under a laboratory director and make it subordinate to the quality control function. Such an arrangement is guaranteed to prevent the effective development of a sanitation program and to block its integration into plant operation. In such a situation, the laboratory director cannot help but insulate the sanitation personnel from effective contact with company executives and departments, and restrict the sanitation activity to only a small part of its potential. That is not to say, of course, that there is not a large area of collaboration and mutual aid as between properly organized laboratory and sanitation functions.

Another fairly sure way of handicapping industrial sanitation and limiting its usefulness is to place its management in a position subordinate to either production or mechanical maintenance management. This automatically restricts it to a much narrower range of work, and prevents the exercise of its police or inspection function which is so important in securing plant-wide order, safety, and quality of products. A subordinate cannot police his superior; but industrial sanitation organized on a level with the other plant functions, and directly representing the plant manager, can far better influence the operations of parallel departments since it can rely to some extent on the manager's support when issues of sanitation have to be resolved.

The inspections by outside agencies, such as health, food quality, labor, safety, fire, building, etc., are never adequate in an industrial plant to achieve their proper objectives unless their interests are represented inside the plant by organized industrial sanitation. Such agencies are all concerned with phases of the work environment; they should devote a part of their official energies to the promotion of that form of organization within the plant which will serve the public interest, not just by sporadic observance of regulations under pressure, but consistently and at a level above the official minimum.

The integration of industrial sanitation means, then, the establishment of the clearly differentiated and supervised function in a manner so solidly useful to plant operation that top management and production supervision cannot do without it. If industrial sanitation is integrated, it cannot be dispensed with or cut out without a process of disintegration which leads to confusion, waste, and loss. When you hear of a company dismissing a person from a supervisory job in industrial sanitation, it means either that he has not produced results because of his own inadequacies, or that his function has not been integrated. As we have said before, failure to develop an integrated sanitation function usually stems from top management mistakes. Such management must establish or evolve the organizational climate in which capable sanitation supervision can achieve its ends of integrated service.

Furthermore, when economic pressures for cutting expenses come on, as they do from time to time in every business, the unintegrated parts of plant maintenance are the first to suffer. The casual maintenance labor and duties may be lopped off without full recognition of the consequences, whereas, integrated industrial sanitation should be so firmly established and so stoutly defended as an essential that it will not have to bear more than its share of any over-all cuts.

The Nabisco Pattern

With your indulgence, and with only a minimum of modesty, I should like to make specific reference to what might be called the Nabisco pattern for industrial sanitation. It was just fourteen years ago that executives of the National Biscuit Company came to the conclusion that there was something fundamentally wrong with the handling of plant sanitation in which everybody in general and nobody in particular was responsible. A radical decision was reached that someone with some apparent qualifications in the field of environmental sanitation should be employed to develop a company-wide sanitation program and given a position and authority appropriate to this objective.

The essence of the Nabisco pattern for industrial sanitation as it has evolved through the years might be set forth as follows:

1. An administrator responsible directly to the president and executive vice-president and receiving genuine, wholehearted support therefrom.
2. A sanitation department in the general office on a level with other departments and in a position to deal with all company operating units, whether purchasing, production, or sales.
3. A sanitation department in each manufacturing unit on a level with other plant departments and with the sanitation supervision directly responsible to the plant manager.
4. A separation of the maintenance of the plant work environment from the production and mechanical maintenance functions and the integration of the diverse sanitation tasks into the other plant activities so as to give a balance of essential support and service.
5. An exercise of surveillance over company-wide operations and within each plant to maintain a reasonable conformance to a high but practical level of sanitation.
6. A participation in plant and machine design and in the selection of sanitation supplies and equipment.
7. A systematic recording of the use of sanitation labor on the basis of a standard pattern of tasks, and a comparative evaluation of sanitation performance and efficiencies in groups of like plants.

Such is the Nabisco pattern for industrial sanitation. It seems to be rational, logical, productive of the desired results, and it is not a side-line, dispensible activity but an integrated, essential part of the company in all its operations. However, this Nabisco pattern is still undergoing refinement and more complete application, and we can see no end to the problems of industrial sanitation or to the possibilities of better service and greater performance efficiencies.

Admittedly, a large, multiple-plant operation has many advantages in administering such an industrial sanitation program, especially in the employment of a person or group able to provide both staff and line services. The competition between plants and the contributions of supervision in the many plants to the solution of common and special problems all help in the development of the over-all program, aided by periodic conferences of sanitation supervision, and coordinated by the general office staff.

SANITATION CONSULTANTS ESSENTIAL

In the smaller companies and in single plant operations, it may be highly desirable to obtain some of these benefits through the employment of sanitation consultants. Too often, the lone and inexperienced individual assigned the industrial sanitation responsibility in a plant is unsure of his ability and of his technical knowledge, and unable to defend his position against the pressures of other departments and the impatience of his superiors. The independent outside consultant can give guidance to company management in the general objectives of such an undertaking, and direct support to the plant sanitarian in the details of his work. The consultant also has the major function of periodically inspecting and evaluating the status of plant sanitation. This service is usually necessary to sustain management's interest in its program until it is well established and to help the sanitarian to move forward in handling his job. Consulting sanitarians are now functioning principally in the food field but their numbers should grow and their fields broaden as industrial managements discover their need for such service. The Institute of Sanitation Management has a great stake in the work to be done by sanitation consultants since those of competence and high ethics will contribute greatly to the growth of industrial sanitation where it is most needed.

ON THE MANAGEMENT TEAM

In summation, the foregoing discussion has largely dealt with sanitation maintenance in industrial plants, but it is no less pertinent to those places wherein services are rendered, such as in hospitals, school systems, hotels, commercial and business establishments, and transportation systems. The need for sanitation is universal and, in many instances, acute. Where it is dispersed and unorganized, it requires management awareness of the need, separation and aggregation of all its parts under its own supervision, and then an integration into the whole operation. In so doing, it becomes recognized as indispensible and capable of increasing effectiveness and its practitioners achieve a rightfully important position on the management team.

The Institute of Sanitation Management is dedicated to these ends. In the nature of the need and the opportunity, you, its members and friends, cannot fail to give to the Institute your full support, and to benefit in turn from its promotion of the integration of industrial sanitation into the work and service environments of our great country.

BETTER DAIRY FARM BUILDINGS [1]

Harold E. Gray [2]

Burnham Corporation, Irvington, New York

Developments in the field of farm dairy buildings have been rapid during the period following World War II. The present trends appear to be toward larger size herds and loose housing systems of management. Striking developments in loose housing include improved pole frame construction, prefabricated buildings and better arrangement and equipment for milking parlors. Sanitary conditions can be maintained with loose housing systems for the production of quality milk. Similar developments have occurred in the stall barn system of housing, which is still quite popular among many dairymen. Prefabricated buildings and tilt-up concrete are the newer methods of construction. Milking parlors and portable milking units are developing as means of reducing chore labor in stall barns. Cooperative efforts between all interests in milk production are essential to the continued development and improvement of farm dairy buildings.

During the period from immediately following World War II to the present there have probably been more developments in the housing of dairy cattle on farms in the United States than any other time since the advent of the milking machine. It is almost unbelievable that this area of development, which remained practically dormant for so many years, should suddenly begin to expand and grow at such a rapid pace. For a good many years farm buildings, including dairy cattle housing, lagged far behind the developments in the mechanization of field operations and developments in the field of farm electrification. What, then, suddenly caused this change of pace in farm building development?

One of the major contributing causes has been the shortage of farm labor, or at best, the high cost of farm labor following World War II. The ratio of the number of farm workers to the total population of the United States has steadily decreased with the consequence that more and more output is required per farm worker. As a result, farm buildings naturally had to follow the pattern. This applied in particular to dairy cattle, which normally require a relatively high amount of labor for care and handling.

All of these developments were not without some disappointments and some mistakes. Some of the new ideas were tried for short periods of time and then had to be given up because they were just not practical. Others have been just too expensive for the average dairy farm herd to support. In still other instances, developments were hampered and restricted by unrealistic sanitary codes. It is extremely difficult, or practically impossible, to build a model 1960 dairy barn according to the specifications of some 1930 sanitary codes.

Now is the opportune time to pause and take stock of our dairy farm building situation and perhaps try to predict the logical direction it should take to keep abreast of our rapidly developing agricultural industry with as few mistakes as possible. The present picture in New York State seems to be a trend toward sizes of herds in the range of 40 to 80 milking cows per farm. Although the absolute figures may vary somewhat, it is reasonable to expect that the trend toward larger herds is pretty much universal throughout the entire country. Along with this increase in herd size in New York State there is evident interest tending toward the loose housing system for dairy cattle as rapidly as conditions permit. Many areas of the country are far ahead of the Northeast region in this trend. Some of the early objections to loose housing, despite the savings in labor and effort, centered around sanitary conditions for the cows. Perhaps one of the contributing factors has been the higher bedding requirements of the loose housing system. This has been particularly critical in the Northeast region, which is not a very extensive cash grain area. Although the bedding problem still remains in many areas, there is sufficient evidence from the rather detailed Wisconsin studies to show that just as good milk can be made with a loose housing system as in a stall barn. Moreover, these studies have disquieted any fears there might have been as to the health of the animals.

Developments in loose housing systems may be categorized under methods of construction and under arrangement and equipment. When new construction is contemplated now, the choice frequently narrows down to either pole frame construction or a prefabricated building. Pole frame construction has gained wide acceptance in most areas of the country where the timbers are available at reasonable cost. This method of construction is relatively inexpensive and rapid. The pressure treatment of the poles that are

[1] Presented at the Annual Meeting of the International Association of Milk and Food Sanitarians, Inc., at New York, September 8-10, 1958.

[2] Formerly Professor of Agricultural Engineering, Cornell University.

used in this construction have added considerable impetus to the method. However, herein lies one of the fallacies of pole frame construction. From an economic standpoint, pole frame buildings are normally built with a life span expectancy of about 20 years. This gives the operator an opportunity to write off his building in that period of time. From an economic standpoint, he is justified in making alterations or complete new construction to keep abreast with developments. The poles, which formerly were the limiting factor in the life of the building, can now, with pressure treatment, have normal life expectancy of some 40 to 50 years. This is something that should be given careful consideration in the design of any new pole frame building.

Prefabricated or precut buildings have definitely established a place for themselves in the farm building field. Prefabrication varies anywhere from the prefabrication of just the structural frame all the way to prefabrication of the complete building. One of the great advantages of these buildings is the flexibility permitted for the operation. These buildings can be modified and remodeled fairly simply to meet changing needs of the enterprise. If the need arises, they can be completely disassembled, moved and reerected on another site. This is an opportunity that should not be overlooked by an operator who wants to really keep abreast of changes and developments. At the present time there are close to 40 manufacturers producing prefabricated buildings in various forms and types. Just recently, a loading code was agreed upon by steel building manufacturers, which is a great step forward in standardization of this method of construction.

The newest development in equipment and arrangement for loose housing system is the so-called herringbone system for layout of the milking parlor. The principle advantage for this system is that the travel from cow to cow by the operator in the pit is reduced considerably. Because of this reduced travel, one operator, in a 12-stall parlor, can milk from 40 to 60 cows per hour. This is faster than can normally be expected of the older, more conventional types of milking parlors.

The capital investment required for a milking parlor with the herringbone system is something to be considered. Although figures will vary from one section to another, a few approximate costs, based on experience in New York State, will give an idea of the cost of a 12-stall parlor. The building to house the parlor, less the foundation, will probably cost around $3,000. The 12 stalls represent about $1200, and automatic feeders for this type system will add another $300. The pipeline milking system, including water heater, washing vat, cabinets, and 6 volumetric measuring devices, represent approximately $3,000. An additional $1500 should be allowed for the foundation, wiring and necessary plumbing. These items, then, add up to a total investment of approximately $9,300. Another $2000 to $3000 can be added for a bulk tank, which is now considered desirable for any pipeline milker system. Although this total may seem high, it is comparable with other types of milking parlors. With the advantages to be gained by a milking parlor, the original investment can be soon written off against savings in labor. The fact that there is considerable reduction in fatigue and saving in energy in the milking parlor over the stooping and squatting required in a stall barn, because of the convenient work heights, is added inducement.

The fact that most of the discussion so far has centered around the loose housing system for dairy cattle is not meant to imply that the stall barn is going out of the picture. There are still a great many stall barns in use and new ones are being built. It would appear, however, that the advent of the loose housing system has served as a catalyst to the development of new methods and equipment in stall barns to reduce labor. One of the earlier developments that was evident was the gutter cleaner, which served to reduce considerably the difference in labor requirements for handling manure in the stall barn and loose housing. The next stage of development seemed to be the around-the-barn pipeline milker, which created some interest a few years back. This did not become too popular because of the high cost involved. Average figures for New York State show an investment of approximately $63 per cow for an around-the-barn pipeline system compared to about half that figure for the pipeline system in a milking parlor.

This, then, led to other developments in an attempt to reduce this cost in a stall barn. One of these is the milking parlor in conjunction with the stall barn system. Although a milking parlor may require a greater investment than the installation of an around-the-barn pipeline because of the extra structure involved, the saving in fatigue and reduction in effort is a worthwhile consideration in favor of this system. A number of these systems are now successfully in operation in New York State.

Another development is in the field of some type of portable milker. These portable milkers are in three common forms. The first is a small, portable milking unit which has a small tank that can be alternated and carried back to the milkroom to dump. The second type of unit carries a larger tank so that the milk from several cows can be taken into the tank before it is wheeled back to the milking parlor. Just how large these tanks can be so that they can still be moved back to the milkhouse remains to be seen. A third type of portable milker includes the portable milking unit and a plastic hose directly back to the bulk tank in the milkhouse. With each of these portable types of milkers there are some sanitation problems. None of these problems, however, are insurmountable.

In the construction of stall barns for dairy cattle housing, prefabricated buildings mentioned earlier have taken their place. There should be a number of new developments in this area. The other type of construction that shows considerable promise is tilt-up concrete. In this method of construction, the concrete slabs for the walls are poured flat and then tilted up into place for the walls after the concrete has set. In this method of construction, certain types of insulation can be formed integrally with the wall slab. Primary advantage of this type of construction is a reduction in cost because of the reduced amount of form work required and the ease of pouring the concrete.

The items, so far mentioned in this paper are only the highlights of the most recent developments in better dairy farm buildings. Many more developments could be cited and it is hoped that many more will occur in the future. Suffice it to say for the present that it is gratifying to note the number of people that are interested in and doing something about the methods of dairy cattle housing. Although this has been a long time coming, the interest that is shown today should be and can be encouraged to the advantage of the entire dairy industry.

RECREATIONAL SANITATION [1]

FRANKLIN D. YODER

Wyoming Department of Public Health, Cheyenne

Webster defines recreation as refreshment by any means, also diversion, play and refreshment of the strength and spirits after toil. Those of us in public health know that sanitation is a way of life in which we believe. It includes those necessary measures to promote a heathful environment and safe food, milk and water for our use. Inspections, elimination of various hazards and certification, standardization and licensing are all needed in appropriate amounts in order that we carry out an adequate sanitation program.

When we begin to talk about recreational sanitation, my subject today, one quickly discovers that there is relatively little material in the public health or medical literature as to what constitutes this field. As a corollary to this statement one can conclude and I think correctly that relatively little data exist so it must be a new field in which it is our duty to explore for the purpose of making progress in public health.

Back in my office it is noticed that when I talk about restroom inspections as a specific example of recreational sanitation, thinking of the many tourists guests in the western region who are dependent upon public restroom facilities, I find my staff members rolling their eyes, tapping ashes from their cigarettes and using various other diversionary tactics to parry my thrusts in the direction of emphasizing this phase of our sanitation program. Since I believe we should enter this new field with vigor, it might be well to stop at this time to select appropriate nomenclature and make some definitions in order that a new program can be designed with a built in evaluation systtem.

Emerson said, "Give me health and a day and I will make the pomp of emperors ridiculous." The Emerson quotation only places in modern language what one of the most basic human documents has to say in the *Apocrypha Ecclesiasticus* 2.24 "Health and a good estate of body are above all gold, and a strong body above infinite wealth." People realize that when they are seeking recreation that this activity in many ways places them at risk. For instance the Equitable Life Assurance Society of the United States has this to say about food when you are travelling. "You do well to keep away from cream and custard filled pastries, meat and potato salads, cold egg mixtures, salad dressings, left over poultry, creamed foods and cold meat unless you know they have been properly prepared, covered from flies and refrigerated. While most roadside stands and restaurants meet sanitation standards you will be much safer if you stick to hot freshly cooked or canned foods."

[1] Presented at the Rocky Mountain Association of Milk and Food Sanitarian's 8th Annual Education Seminar, University of Wyoming, Summer Camp Centennial, July 7, 1958.

Recreational Activities

Just what do we mean by recreational activities? Let's look at the list as published by the National Recreation Association. It states that the following activities are available in our National Parks.

Concerts	Bridle paths, riding stables
Open-air opera	Hiking, camping
Gymnastics and sports	Streams and lakes, fishing, boating
Playground contests	Swimming
Table games	Wading pools
Hobby shows	Roller skating rinks
Nature study	Bicycle tracks
Gardening	Golf courses
Punch and Judy shows	Gymnasiums
Outdoor story hours	Playfields
Dancing pavilions	Baseball diamonds
Clambakes and picnics	Tennis courts
Athletic fields	Ping pong tables
Coasting areas	Shuffleboard
Football gridirons	Handball courts
Paddle tennis courts	Bowling greens
Badminton	Children's playgrounds — swings, slides, and so on.
Basketball courts	Special classes in dancing, crafts, and dramatics.
Horseshoe pits	
Archery greens	
Doll villages	
Casting Pools	

We who live in the west are still living in what is left of America's frontier area. This area happens to contain if you include the mountain and pacific states, ninety per cent of the major natural areas of the continental United States considering national parks, national monuments and national forest in terms of acreage. Does this not represent a worthy challenge to public health in providing, not only an adequate recreational sanitation program but also doing our part in preserving these valuable natural areas for future generations? In this connection the National Recreational Association also emphasizes that people should be careful not to leave newspapers, lunch boxes or other debris scattered on the ground. They say, "We can be careful not to break any shrubs, pick flowers or walk on newly grassed areas. We can obey the regulations and teach our children the value of our parks too. Then we can take pride in them. Some parks have a bit of poetry posted: We'd all do well to learn it by heart — *Let no one say, and say it to our shame, That all was beauty here until we came.*" This does not mean that we want to go out and attempt the enormous task of eliminating microorganisms through an overzealous sanitation program. We know that bacteria can for instance play the role of man's best friend or other microbial organisms such as algae provide many possible future developments. We think of them today as an essential part of the process in our sewage oxidation ponds which handle so efficiently some of our pressing sewage treatment problems. We hope that we will never approach the pristine state of the germ free animals in the laboratories at the University of Notre Dame which rapidly succumb to such bacteria as the colon bacillus normally present and harmless in every living mammal. We are reminded with our present problems involving staphylococcus infections in modern hospitals that we had better learn to live with microorganisms rather than attempt their total elimination.

Human Resources

We hinted at this before but we might as well say now that our highest endeavor is to develop human resources to their utmost. We are entering a period when it is said that recreation will occupy an ever increasing place in human activities. Naturally it follows that a recreational sanitation program is important in any program for the betterment of mankind.

General Factors

The more people in a country, state or city the greater obviously is the demand for outdoor recreation. The total number of people in the United States has increased from four million in 1790 to one hundred seventy million plus in 1958 — or an average annual rate for this whole period of very close to two and one-fourth percent or a decade rate of about twenty-five per cent.

Income per person also affects recreation. In general the higher a family's income the larger is the percentage spent for this purpose. The amount of leisure available to the average person has also risen greatly over the past several decades. The average work week of all employed people including those in agriculture has declined from seventy hours in 1850 to forty hours in 1950. In part this decline is due to the shift from agriculture with its traditionally long hours of work to industry with its shorter hours but some of it is due to fewer hours per day, and per week and to more paid vacations. There are more elderly retired people today than ever before. Longer years of schooling and child labor laws have given youth more time for recreation.

Our people are more mobile than in earlier years or than are the people of most countries. The miles travelled per average person have increased ten-fold since 1900. Most of this travel can probably be said to be for the sake of recreation. When four logically causal factors, more people, higher income per capita, more leisure and more mobility have been operating in the same direction and at somewhat the same rate it is extremely difficult to measure the extent to which each separately has been responsible. I hope you can now begin to see the importance for intelligent planning toward an adequate recreational sanitation program to meet future needs. We will need the understanding of the general public and those who are responsible for the spending of public money in order to secure necessary funds.

TECHNOLOGICAL DEVELOPMENT

The problem we are discussing seems so large and hazily defined that it frightens one to consider methods of proper solution. We should not be discouraged. We live today in a world which is marked by unparalleled speed of technological development in which the rate of progress itself is on an ever increasing spiral. To put it mathematically it is a world in which the second derivative of distance with respect to time is neither zero nor constant, but seems always to have an increasing positive value. It took almost 100 years for the invention of James Watt to be applied in a practical manner to the generation of mechanical power from steam, but it took only six short years after the splitting of the atom by Drs. Hahn, Strassman and Meitner to bring into being one of the most powerful forces ever unleashed by man. These thoughts were expressed by Dr. Willard F. Libby, Atomic Energy Commissioner, and he further projects them in seeing a real danger that the rate of basic discoveries is not keeping pace with the rate of utilization. Although he is speaking more specifically of the atomic energy field I feel that we can apply the same principle to the field of public health. We need to expand our basic program before disaster or irretreivable damage occurs.

RADIOLOGICAL HEALTH

One of the problems with which we must be concerned in recreational sanitation and also in our more traditional general sanitation programs is radioactive surveillance with regard to water, air and food (including milk). You will be interested to know that the Public Health Service is conducting a pilot study in milk sheds serving Sacramento, Salt Lake City, St. Louis, Cincinnati and New York City. Milk samples are analyzed for specific radioisotopes including strontium 90, strontium 89, iodine 131, barium 140 and cesium 137.

Another reason for us to pay extra attention to the field of radiological health is that in this area there is relatively little voluntary agency participation. In other words it is principally a governmental field and unfortunately governmental activities are not generally noted for their spontaneous and inspirational development. I believe that we public health people can as in the past disprove this with regard to our own field, but we had better do more than just talk about it.

In our time of astronomical expenditures for the business of developing weapons of destruction — public health expenditures which might be considered the weapons of salvation receive minuscule appropriations. Hopefully but dependent upon world affairs this may change very rapidly and then one of the most logical places to expend large amounts of money would be in the field of public health. Will we be ready for it?

BASIC RESEARCH

I think it would be worth the time to restate what we all know, namely, that it is worthwhile to do basic research. It serves the practical purposes of our society be they military, economic or social. Briefly the answer is that the laws of nature rule everything and a better understanding of nature allows us to do things more efficiently and to attain goals which would otherwise be impossible. It gives us more power, it raises our standard of living, gives us leisure time and gives us a sense of change and advancement which particularly in America is necessary to a sense of social well-being. We are on the move because we are learning and because we have learned and are coming to a full understanding of the significance of our new knowledge.

Alright you will say I have been talking a long time about the general background of our problem and needs for a solution, but you have failed to outline specific consideration of future programs. I will answer what you are thinking by saying that we must take off on a new program from our present position.

THE FUTURE

Earlier I spoke of restroom sanitation as an example of recreational sanitation. We must expand and concentrate on resort sanitation, sewage disposal problems, wilderness area protection, insect control, rodent control, and other programs which we now understand but which must be interpreted in the light of expanded recreational needs. Although we are fortunate in having a close coordination with other departments of state government we for instance must develop a closer relationship with those people who are working in game and fish management programs. A recent problem in the wilderness areas of Wyoming has highlighted the need for interdepartmental cooperation between wildlife authorities and health department personnel. Federal, state and local government representatives must meet and plan intelligent use of our major natural areas. Through interest in public health they can work together toward the common goal of preserving nature, preventing human illness and promoting spiritual refreshment so important to development of human resources.

VIRUCIDAL ACTIVITY OF A NEW PHOSPHORIC ACID-WETTING AGENT SANITIZER AGAINST BACTERIOPHAGE OF STREPTOCOCCUS CREMORIS [1, 2]

HELEN HAYS AND P. R. ELLIKER

Oregon Agricultural Experiment Station, Corvallis

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Dairy plant sanitation procedures represent one of the chief factors affecting incidence of starter failure caused by bacteriophage in cultured milk products. Consequently there is much interest in the virucidal activity of the sanitizing agent used. A new phosphoric acid-wetting agent sanitizer (PAWA)[3] which consists chiefly of orthophosphoric acid plus nonionic and anionic surface active agents, has been developed for use as a dairy sanitizer. Studies were conducted to determine the ability of this new sanitizer to destroy bacteriophage active against a representative lactic streptococcus. Its virucidal activity also was compared with other commonly used sanitizers such as hypochlorites, iodophors, and quaternary ammonium compounds (QACs).

Streptococcus cremoris phage strain 144F was employed in the virucidal trials as a representative phage. The virucides selected were of the type commonly employed in general dairy and food plant sanitizing procedures. In addition to the new PAWA sanitizer the following were used: calcium hypochlorite $Ca(OCl)_2$ and sodium hypochlorite NaCl0, several iodophors (I-1, I-2, and I-3), a product consisting of potassium iodide and chloramine-T, also known as diatomic iodine (DI), and a QAC (alkyl dimethyl benzyl ammonium chloride.)

The PAWA sanitizer was diluted according to the manufacturer's instructions and approximate concentration established with 0.35 N sodium hydroxide solution. The standard thiosulfate titration *(1)* for determining available chlorine was used for the hypochlorites and the iodophors were titrated to a colorless end point with standard thiosulfate. QAC concentrations were determined by the method of Furlong and Elliker *(3)*. Virucide solutions were diluted with distilled or USDA *(2)* buffered water of 500 ppm hardness.

The technique for evaluating virucidal activity was that used by Watkins, Hays and Elliker *(5)* with the following modifications: A M/50 phosphate buffer solution at pH 7.2 was used to inactivate the PAWA sanitizer. Thiosulfate inactivator solutions for the hypochlorites and iodophors and lectithin-Tween 80 inactivator solutions for the QAC were prepared in M/100 phosphate buffer at pH 7.2.

Whey filtrates of a phage strain of S. *cremoris* 144F were prepared as described by Parker and Elliker (*4*) with the following variations: The whey filtrate containing the propagated phage was passed through a Seitz filter instead of being filtered through a Selas candle. The cell free filtrate was transferred to a sterile bottle containing an excess of $CaCO_3$ to neutralize whey acidity. A 1:100 dilution of this filtrate in sterile water was used for virucidal trials. Distilled water was used for filtrate dilution in those trials where the virucide was tested in distilled water and USDA water was used to dilute the phage in trials where the virucides were tested in USDA water. The plaquing procedure was the same as described by Watkins, *et al.* (*5*).

RESULTS

Results shown in Tables are representative of those obtained with three different strains of bacteriophage specific for lactic streptococci. Those represented were obtained using phage for S. *cremoris* 144F.

Table 1 shows a comparison of various germicides in buffered hard water against S. *cremoris* phage. The recommended dilution of 1-128 to give 200 ppm of the active ingredients of the PAWA sanitizer completely inactivated the phage within 15 seconds. The QAC in a concentration of 50 ppm and 25 ppm of both $Ca(OCl)_2$ and NaOCl also inactivated the phage in 15 seconds. The I-1 in a concentration of 25 ppm showed a slower rate of virucidal activity and failed to completely inactivate the phage after 60 seconds of exposure. The DI compound in 25 ppm failed to inactivate the phage in 15 seconds but was effective after a 60 second exposure period.

Studies were conducted to compare differences in activity of several virucides when distilled and buffer-

[1]Technical Paper No. 1195 Oregon Agricultural Experiment Station. Contribution of the Department of Bacteriology.

[2]This study was supported in part by a grant from Pennsalt Chemical Corporation.

[3]Trade name for the product used in these studies is Pennsan.

TABLE 1 — COMPARISON OF VARIOUS GERMICIDES IN 500 PPM HARDNESS USDA WATER AGAINST *Streptococcus cremoris* PHAGE STRAIN 144F

Virucide	Conc.	Final pH	Plaque count after following exposure times: 15 sec.	60 sec.
	(ppm)			
PAWA	200	2.35	0[a]	0
QAC	50	8.65	0	0
$Ca(OCl)_2$	25	8.35	0	0
NaClO	25	8.7	0	0
I-1	25	6.4	24	3
DI	25	7.5	4	0

[a]Initial count of phage-germicide mixture 16 x 10^5 per ml. Plaque count after exposure represents number per ml of a 1:10 dilution of phage-germicide mixture.

ed hard water were used as diluents. As indicated in Table 2, concentrations of 100 and 200 ppm of the PAWA sanitizer in both types of water inactivated the phage in a 15-second exposure period. $Ca(OCl)_2$ also was effective in either diluent when used in a concentration of 25 ppm. Three different iodophor compounds showed a slower rate of activity at 25 ppm in both types of water. All three failed to inactivate the phage within 15 seconds in either diluent. In distilled water two of the compounds inactivated the phage after 60 seconds and the third showed marked reduction in number of surviving plaques. However, in the buffered hard water none of the iodophor compounds gave complete inactivation of the phage after a 60-second exposure period.

TABLE 2 — COMPARISON OF VIRUCIDAL ACTIVITY OF VARIOUS SANITIZERS IN DISTILLED WATER AND 500 PPM HARDNESS USDA WATER AGAINST *Streptococcus cremoris* PHAGE STRAIN 144F

Virucide	Concentration	Final pH	Plaque count after following exposure times: 15 sec.	60 sec.
	(ppm)			
PAWA	100			
Distilled water		2.2	0[a]	0
USDA water		2.25	0	0
PAWA	200			
Distilled water		2.0	0	0
USDA water		2.0	0	0
$Ca(OCl)_2$	25			
Distilled water		6.9	0	0
USDA water		8.2	0	0
I-1	25			
Distilled water		2.8	73x10^1	0
USDA water		6.25	20x10^2	20x10^1
I-2	25			
Distilled water		3.05	61x10^1	3
USDA water		6.1	122x10^1	125
I-3	25			
Distilled water		2.65	16x10^1	0
USDA water		5.2	176x10^1	48x10^1

[a]Initial count of phage-germicide mixture: 39 x 10^5 per ml. Plaque count after exposure represents number per ml of a 1:10 dilution of phage-germicide mixture.

TABLE 3 — VIRUCIDAL ACTIVITY OF VARIOUS CONCENTRATIONS OF A PHOSPHORIC ACID-WETTING AGENT SANITIZER AGAINST *Streptococcus cremoris* PHAGE STRAIN 144F IN DISTILLED AND USDA TEST WATER

Concentration	Type of water	Final pH	Plaque count after following exposure times: 15 sec.	30 sec.
(ppm)				
12.5	Dist.	2.85	0[a]	0
	USDA	6.6	180x10^3	131x10^3
25	Dist.	2.4	0	0
	USDA	5.8	124x10^3	113x10^3
50	Dist.	2.2	0	0
	USDA	3.0	0	0
100	Dist.	1.95	0	0
	USDA	2.25	0	0
200	Dist.	1.7	0	0
	USDA	2.0	0	0

[a] Initial count of phage-germicide mixture: 14 x 10^5 per ml. Plaque count after exposure represents number per ml of a 1:10 dilution of phage-germicide mixture.

Trials were made with the PAWA sanitizer (Table 3) to determine how much it could be diluted and still retain virucidal properties. When diluted to a concentration of 1-2048 (approximately 12.5 ppm) in distilled water, it inactivated the phage within 15 seconds. When buffered hard water was used as the diluent, a dilution of 1-512 (50 ppm) inactivated the phage in 15 seconds, but 1-1024 (25 ppm) failed to inactivate the phage after a 60-second exposure. Activity in the two types of water appears directly related to the pH of the final germicide-phage solution. In distilled water the pH of the final solution was less than 3.0 in the highest dilution used. In the buffered water there was a marked increase in pH between the 1-512 dilution and the 1-1024 dilution. The former was pH 3.0 while the pH of the latter was 5.8.

DISCUSSION

Results of this study and an earlier investigation (5) suggest that pH of solution represents a critical factor in determining rate of destruction of bacteriophage by some acid sanitizing agents. Hypochlorites in this and previous studies demonstrated a high rate of activity against all lactic streptococcus bacteriophage strains employed. Whether or not QAC activity may be enhanced by use of an acid product was not established in this investigation.

Initial concentration of bacteriophage particles might be expected to affect efficiency of any specific concentration of a sanitizer within certain limits. Bearing this factor in mind, the critical pH for rapid destruction of bacteriophage for the acid-wetting agent in these studies appeared to be in the range of 2.0 to 3.0. It is possible also that surface agents employed in the acid-wetting agent sanitizer contributed to phage inactivation. In general, results suggested that a concentration of 200 ppm, as recommended for use dilution of this product, maintained the pH in the range of 2.0 to 2.35 which should assure a high rate of phage destruction. Dilution of the product to sublethal levels and trials in unbuffered and synthetic hard water merely served to emphasize the significance of pH in determining activity of the phosphoric acid-wetting agent.

SUMMARY

A comparsion was made under laboratory conditions of the relative effectiveness of a new PAWA sanitizer and representative hypochlorites, QAC, and iodophor compounds in the destruction of lactic streptococcus bacteriophage. The effect of dilution and buffered hard water on the activity of the new sanitizing agent also was studied.

Both NaOC1 and $Ca(OC1)_2$ in a concentration of 25 ppm completely inactivated the phage of *S. cremoris* 144F during a 15-second exposure period. The idophor compounds showed a slower rate of activity when used in a concentration of 25 ppm. In distilled water a 60-second exposure period was required for complete destruction of the phage and in buffered hard water the efficiency was greatly decreased. A concentration of 50 ppm QAC was effective in a 15-second exposure period.

The PAWA sanitizer was effective in concentrations as low as 12.5 ppm during a 15-second exposure period in distilled water but in buffered hard water a concentration of 50 ppm was required to inactivate the phage in 15 seconds. The results suggest that this sanitizer when used in recommended concentration of 200 ppm should provide an effective agent for destruction of bacteriophage on dairy equipment.

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INSECTICIDE RESIDUES IN MILK AND MILK PRODUCTS[1]

I. Insecticide Residues in Milk from Treatment of Dairy Cows and Barns

E. H. Marth and B. E. Ellickson

Research and Development Division National Dairy Products Corporation, Glenview, Illinois

Introduction

During the last decade numerous organic insecticides have been synthesized. The impetus for this activity came during the war when supplies of botanical insecticides such as pyrethrum and derris from Africa and the East were cut off and when the demand was great for high levels of agricultural production (*29*). The first of these organic insecticides to be synthesized were DDT and benzene hexachloride. Since then, a considerable number of insecticides of the chlorinated hydrocarbon type and more recently of the organic phosphate type have been synthesized. Many of these insecticides have been used to control dairy cattle insects and also insects which infest forage crops that are consumed by dairy cattle. Such use has led to contamination of milk and milk products with these chemicals.

Dairy cattle are most commonly treated with insecticides to control flies, lice and grubs. The largest quantity of insecticides probably is used in attempts to control various kinds of flies. The importance of fly control to the producer can be appreciated when it is realized that twenty biting hornflies can consume one pint of a cow's blood in a week and can cause milk production to be reduced by three pints per day (*2*).

This paper will attempt to summarize information on residues of insecticides present in milk as a result of the treatment of dairy cows and barns. Other papers in this series will summarize information on insecticide residues in milk as a result of feeding treated crops to dairy cows (*35*) and on insecticide residues in milk products together with associated problems (*34*).

Chlorinated Hydrocarbon Insecticides

DDT

This insecticide has been suggested for use in the control of various types of flies (*3, 4, 5, 8, 10, 25, 28, 30, 40*) and lice (*43, 45*). It was found ineffective in the control of cattle grubs (*36*).

Recommendations in regard to the concentration of DDT in sprays applied to cattle vary somewhat. Laake (*30*)found that treatment of all cattle in a herd with a 0.2 per cent suspension of DDT gave protection against horn flies. Cory and Langford (*10*) applied a one per cent solution of wettable DDT powder to cattle and buildings at a pressure of 400 to 500 p.s.i. Cattle were protected against flies for three to six weeks and buildings for ten weeks. A two per cent solution of DDT in water applied to heifers at a pressure of 250 p.s.i. protected against horn flies from July to October (*40*). Bret and Fenton (*3*) reported that DDT was effective in the control of house flies and horn flies but not horse flies and heel flies when the barn was sprayed with a five per cent solution of watermiscible DDT powder at the rate of one gallon per 1000 square feet of surface area.

Experiments were reported (*28*) in which Holstein and Jersey cows were sprayed either daily with a five per cent water emulsion or suspension of DDT or semi-monthly with a 0.25 per cent suspension or emulsion. They found no DDT residues in the milk until the seventeenth day after the start of the spraying procedure. Maximum levels of DDT were attained more rapidly in the milk of cows sprayed with emulsions instead of suspensions, however, the levels ultimately obtained with both types of spray were about the same (*e.g.*, 19 p.p.m.). The milk from one animal which was sprayed daily with a five per cent suspension attained a maximum of 33.6 p.p.m. of residual DDT. Appreciable quantities of DDT were present in the milk of two cows at the close of their lactation periods 119 and 126 days after the final spraying. When these cows freshened 91 days later, no DDT was found in the milk.

Four dairy herds and barns were sprayed with a 0.5 per cent suspension of DDT as frequently as necessary for the control of horn flies during the 1948 season (*7*). Milk contamination during this period was in the range of zero to 1.3 p.p.m. with an average of 0.21 p.p.m. of DDT.

Carter, *et al.* (*5*) reported that the average DDT concentration in milk for a seven month period was 0.5 p.p.m. with a maximum of 2.0 p.p.m. when cows were sprayed with a 0.5 per cent suspension. When a 0.25 per cent suspension was used, the average DDT concentration in milk for a seven month period was 0.3

[1] First in a series of three review articles on this subject which will appear in this Journal.

p.p.m. with a maximum of 1.5 p.p.m. Further work (*4*) showed that when grade Jerseys in full lactation were sprayed with a 0.5 per cent concentration of DDT, 21.8 p.p.m. appeared in milk two days later. This amount gradually dropped to 0.6 p.p.m. in 21 days.

The most important factor contributing to the loss of DDT from the hair of cattle is the licking of themselves or each other (*21*). Sunlight, rain, loss of hair, sloughing off of sebaceous secretions and absorption by the hair were found to be of little significance (*21*). A study (*7*) was made to determine the source of milk contamination when barns were sprayed with a 2.5 per cent concentration of DDT. Three experiments showed that the insecticide was actually secreted in the milk and did not get into the milk after milking by mishandling of it or milking equipment. Furthermore, contamination of milk did not result from inhalation of the insecticide by the cows but instead it came from ingestion of spray residues left on feed troughs. Another view was reported by Harris, *et al.* (*25*) when they found that milk contamination in barns sprayed with DDT resulted only from the careless handling of milk rather than from the cow after inhalation, or ingestion of the insecticide.

Strains of DDT-resistant flies have developed since the widespread use of the insecticide was instituted. This tendency toward development of resistant strains was already noted in 1948 (*33*). The presence of high levels of DDT-dehydrochlorinase in some tissues of DDT-resistant house flies was observed by Miyake, *et al.* (*37*). It was suggested that this enzyme catalyzes the dehydrochlorination of DDT to a nontoxic compound and hence may be responsible together with lipoproteins for protecting resistant flies. A recent report (*1*) suggested that cattle lice have also developed resistance to DDT.

Methoxychlor

This chlorinated insecticide is related to DDT but is less likely to accumulate in milk and the fatty tissues of animals. Some flies have developed resistance to methoxychlor (*32*).

The use of methoxychlor as a spray for the control of flies on dairy cattle has been suggested by several investigators (*4, 5, 6*). Other suggested uses include application to dairy barns as a residual spray for fly control (*12, 24*) and application to dairy cattle by means of back rubbing devices for control of flies (*42*) and lice(*20*). When applied to dairy barns as a residual spray, methoxychlor controlled flies for periods of three to four weeks (*12, 24*).

A mixture of methoxychlor and butoxypolypropylene glycol has also been suggested for use as a residual spray in dairy barns (*24*) and for direct application to dairy cattle by means of a back rubbing device for control of horn flies (*42*).

Carter, *et al.* (*5*) found that organic chlorine residues in milk from cows sprayed with methoxychlor were too small to positively indicate the presence of the insecticide. More recently, they reported (*4*) that when cows were sprayed with a 0.5 per cent solution of methoxychlor, 0.4 p.p.m. appeared in milk drawn two days later and 0.08 p.p.m. was found in milk drawn after 21 days. Clayborn and Wells (*6*) found that only relatively small amounts of methoxychlor were secreted for short periods of time by cows sprayed with the insecticide. Cows were sprayed with either a 0.5 per cent methoxychlor solution or a solution which contained five per cent methoxychlor and 50% butoxypropylene glycol in experiments reported by Helrich, *et al.* (*26*). They found methoxychlor residues of 0.13 to 0.32 p.p.m. in milk 12 hours after application. The residues gradually disappeared from subsequently drawn milk.

Benzene Hexachloride and Lindane

Benzene hexachloride is a chlorinated insecticide referred to as BHC. It has a persistent, disagreeable odor which may impart off-flavors to foods (*32*). Lindane is a purified form of the gamma isomer of BHC and has little or no objectionable odor (*32*). House flies have developed resistance to lindane (*24, 32*).

Benzene hexachloride has been suggested for use on dairy cattle to control flies (*17*) and lice (*16*). Spraying cattle with a 0.5 per cent solution was suggested for the control of flies while a 0.15 to 0.30 per cent solution used as a dip was suggested for the control of lice (*16, 17*).

It was indicated in 1947 that BHC might appear in milk from treated cattle (*16*). This was confirmed in 1948 (*17*) when BHC was detected in cream produced by previously sprayed cows. A maximum of 5.5 p.p.m. of the gamma isomer of BHC was detected on the day after treatment and smaller amounts were found for eight additional days. Cows were unable to lick themselves or each other and hence it was believed that BHC was absorbed through the skin.

Lindane has also been suggested for use on dairy cattle to control flies (*41*) and lice (*20*). Several reports (*1, 13*) have indicated that lindane was inferior to other insecticides in the control of cattle lice, perhaps because resistant strains have developed.

Ely *et al.* (*15*) found that lindane, in concentrations up to 3.5 p.p.m. was present in milk from sprayed cattle on the day after treatment.

Dieldrin

Dieldrin is a chlorinated insecticide primarily used for the control of fruit and vegetable insects (*32*).

It has been suggested for use in the control of flies and lice on dairy cattle (*4, 6, 13*). Roth and Johnston (*44*) have found that grubs can be controlled by injecting cattle subcutaneously with 25 mg. of dieldrin.

Claborn and Wells (*6*) found dieldrin in milk from sprayed dairy cows for 14 to 20 days after treatment, although highest concentrations were present after two to three days. Carter, *et al.* (*4*) detected 5.6 p.p.m. of dieldrin in milk from cows which had been sprayed two days previously with a 0.5 per cent solution of the insecticide. Nineteen days later the level of dieldrin in milk had dropped to 0.12 p.p.m.

Chlordane

Chlordane is a chlorinated insecticide which is widely used to control household pests, termites, soil insects and plant-feeding pests. Some animal parasites have developed resistance to this insecticide (*32*). A 0.5 per cent concentration was suggested (*5*) for use to control horn flies on dairy cattle. An examination of milk from sprayed cows failed to show detectable amounts of the insecticide.

Cattle lice were controlled with a five per cent concentration of chlordane in oil applied by means of a back rubbing device (*39*). De Foliart (*13*) found that lice on cattle could be satisfactorily controlled for four to five months with a single spray application of a 0.5 per cent chlordane solution. It was further noted that combinations of chlordane with BHC, lindane or malathion did not prolong control beyond that obtained with chlordane alone.

Other Chlorinated Insecticides

Dairy cows were sprayed with a 0.5 per cent concentration of Dilan for fly control according to Carter, *et al.* (*4*). They found 0.7 p.p.m. of Dilan in milk from treated cows after two days and 0.15 p.p.m. after 21 days. Similar experiments were carried out with a 0.5 per cent solution of perthane and 0.4 p.p.m. appeared in milk after two days while 0.08 p.p.m. was present after 21 days. Perthane has also been suggested for use in the control of lice (*13*).

Toxaphene has been suggested for use on dairy cattle to control horn flies (*5*) and lice (*38*). No toxaphene was found in milk from cows which were sprayed with a 0.5 per cent concentration (*5*).

When cows were sprayed with a 0.5 per cent concentration of TDE, 1.2 p.p.m. appeared in milk from treated cows.

Heptachlor, an insecticide similar to chlordane (*32*), has been found effective in the control of cattle lice (*13*). Its low cost may be an important point in its favor (*13*).

ORGANIC PHOSPHATE INSECTICIDES

Diazinon

This compound is a phosphate insecticide and miticide used primarily in the control of DDT-resistant flies (*32*). Diazinon has been suggested for use in the control of flies in dairy barns and thus on dairy cattle (*18, 19, 22, 23*). Hansens (*22*) found that diazinon, when applied to barns in a one per cent concentration, controlled flies for 12 or more weeks. An application of a 0.5 per cent concentration resulted in seven to twelve weeks of control. Milk from cows housed in barns sprayed with diazinon contained none of the insecticide and showed no flavor changes (*22*).

Malathion

This insecticide is widely employed for the control of insects on trees, shrubs, flowers and field crops. It is also used for the control of insects in and around buildings (*32*).

Malathion has been suggested for the control of flies in dairy barns (*12, 22, 23*) and flies (*4, 9*) and lice (*13, 20*) on dairy cattle. It has been reported that malathion-resistant house flies have developed in an area where the insecticide was used for 2.5 years (*31*).

When used in dairy barns, malathion mixed with sugar controlled flies for two to four weeks (*22, 24*). De Foliart (*12*) reported that flies in dairy barns were controlled for one to two weeks with a 1.25 per cent concentration of malathion with or without added sugar.

A two or five per cent concentration of malathion applied by means of a back rubbing device has been suggested for the control of cattle lice (*20*). De Foliart (*13*) found that a 0.5 per cent malathion spray controlled lice on cattle for four to five months and destroyed 52 per cent of the louse eggs on the animal.

The use of malathion for control of flies on dairy cattle was suggested by Claborn, *et al.* (*9*) who found residues of 0.08 to 0.36 p.p.m. in milk five hours after cows were sprayed with a 0.5 or one per cent solution of the insecticide. Traces of the insecticide were found after 24 hours and no residue was detected in the milk three and seven days after the cattle were sprayed.

Carter, *et al.* (*4*) reported that less than 0.1 p.p.m. of malathion was found in the milk from dairy cows five hours after they were sprayed with a 0.5 per cent concentration of malathion. Traces of the insecticide were present 24 hours after spraying and it was completely absent from subsequent samples.

Chlorthion

This compound is commonly used for the control of insects on non-food plants (*32*). It has been suggested for the control of flies in dairy barns (*22, 24*). A 0.5 per cent concentration provided control of three to five weeks while a one per cent concentration controlled flies for seven weeks. Chlorthion was not detected in milk from cows housed in a previously sprayed barn according to the results of Dahm and Raun (*11*).

Other Organic Phosphate Insecticides

Several other insecticides of this type have been suggested for use in dairy barn fly control. They include: isochlorthion (*11*), malrin (a mixture of malathion and perthane), American Cyanamid 4124, Bayer 21/199 (*19*) and pirazonin (*23*). The work of Dahm and Raun (*11*) showed that no residues of isochlorthion appeared in the milk from cows which were housed in previously sprayed barns. No information appears to be available on residues in milk of the other compounds mentioned above when they were used for the control of insects on dairy cattle or in dairy barns.

OTHER INSECTICIDES AND INSECT REPELLENTS

Emulsions and suspensions of piperonyl butoxide and pyrethrins have been suggested for the control of flies (*14, 27*) and lice (*45*) on dairy and beef cattle.

More recently, the use of repellents either singly or in combination with an insecticide has been suggested (*2, 46*). It has been claimed (*2*) that the use of repellents would serve to: (a) prevent the harming of desirable forms of wildlife, (b) prevent extermination of the bee, and (c) permit man to employ certain pests to destroy other pests. At present, the U.S.D.A. is taking a "dim view" of repellents since they do not persist on animals for long periods of time (*2*).

Repellents used include: butoxypolypropylene glycol; N, N-diethyl-m-toluamide; 2, 3, 4, 5-bis (Δ2-butylene) tetrahydrofurfural; n-octyl bicycloheptene; di-n-butyl succinate (approved in 1957 by F. & D. A. for use on dairy cows), and di-n-propyl isocinchomeronate (registered with U.S.D.A. for use in spraying barns, dairy and beef cattle).

Toren, *et al.* (*46*) investigated the presence of 2, 3, 4, 5-bis (Δ2-butylene) - tetrahydrofurfural in milk from cows sprayed daily for five weeks with this repellent. Their method of analysis was sensitive to the presence of 0.1 p.p.m. of the repellent. No milk samples tested were found to contain this minimum amount.

SUMMARY

When clorinated hydrocarbon insecticides were used in dairy barns or on dairy cows, residues of benzene hexachloride, DDT, dieldrin, dilan, lindane, methoxychlor, perthane and TDE appeared in the milk. Such residues varied in magnitude from 0.4 p.p.m. for methoxychlor and perthane to 33.6 p.p.m. for DDT. Levels of insecticide residues in milk generally decreased after exposure of the cow but, in some instances, low levels persisted for long periods of time. Some insects have developed resistance to certain chlorinated hydrocarbon insecticides.

Organic phosphate insecticides suggested for use in the management of dairy cattle include: American Cyanamid 4124, Bayer 21/199, chlorthion, diazinon, isochlorthion, malathion and pirazonin. Residues of organic phosphate insecticides tested generally did not appear in milk after use in dairy barns. Resistance of files to malathion has been reported.

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Special Service Article

SOME ESSENTIALS OF FOOD ESTABLISHMENT SANITATION

Editor's Note: This is the third in a series of articles on the above titled subject. This article and those to follow will review and discuss certain selected aspects of this important public health problem.

In the two previous articles on this subject, the importance of the physical health of food workers was stressed, and the necessity for a careful scrutiny of food wholesomeness was emphasized, respectively. This article, presented as the third of the series, will discuss refrigeration and the cold storage of food.

Food Refrigeration — Its Purpose

Food refrigeration ranks high on the list of essentials in food control. Next to people and food wholesomeness it is undoubtedly the outstanding safeguard to sanitary food quality and public health protection. If perishable foods are not effectively held at low cold temperatures, many of the other public health precautions which must be taken to protect food will be negated.

The refrigeration of food has three distinct purposes. The first is the preservation of food by arresting the multiplication and proliferation of bacteria in and on the food. Secondly, in the food itself metabolic action takes place, but this is arrested to a considerable degree in a cold atmosphere. Finally, enzymatic action is retarded. Both metabolic and enzymatic action have much to do with the flavor, nutritive value and palatability of food. While control in all three instances contributes to the healthfulness of food, the most important consideration in terms of food sanitation is that relating to the control of bacterial growth. It is upon this point primarily that food ordinances specify temperature limits for the storage of food at low temperatures.

Temperature Requirements

While the majority of food ordinances and regulations establish 50°F as the upper limit for the refrigerated storage of perishables, this temperature is not sufficiently low for a considerable number of readily perishable foods. To give added emphasis to this point, the following examples are given by kinds of fresh foods and showing preferred and recommended temperatures. [1]

Kind Of Food	Recommended Temperature Range (°F)
Vegetables*	36-45
Cured and Processed Meats	36-40
Fresh meat	34-38
Fresh poultry	29-32
Seafood:	
a. Fresh fish	25-30
b. Boiled lobsters	36-40
c. Oysters, shucked	23-30
Fresh milk	40-45

* Some exceptions are, sweet potatoes, spinach, eggplant, celery and endive. In these cases temperatures up to 55° may be allowed.

This abbreviated tabulation emphasizes that the type of food to be refrigerated is a highly important factor in determining proper and effective temperature and that a single temperature standard fails to consider the relative perishability of different kinds and classes of foods. It is certainly logical to assume that a maximum limit of 50°F for the storage of fresh perishable foods is too high for the great predominence of foods and that a top limit of 40°F has more validity.

Adequacy Of Refrigeration

While temperature requirements form the foundation for the proper holding and storage of fresh perishable foods, the amount and adequacy of refrigeration is a point of almost equal importance. Adequacy, to a large degree has to be judged in the light of a number of variables. It is not possible to say that a food service establishment serving "X" number of customers per day will need "Y" cubic feet of refrigeration space. This is true for a number of reasons, among which are the following: [2]

1. The type of establishment, that is, whether table service, cafeteria, lunch counter, drive in, supper club, etc.
2. The types of patrons. This will largely determine the size and elaborateness of the average menu and is basic in establishing the minimum refrigeration needs.
3. Size and seating capacity and the customer turn over during meal time. A quick lunch counter in which

the average turn over per seat is 12-15 minutes might be a small establishment in floor area, but require larger refrigeration facilities in respect to its size than a large dining room where patrons eat leisurely and seat turn over during luncheon and dinner periods is relatively light.

4. In the case of resort restaurants, roadside eating places and those effected by seasonal influx of patrons, refrigeration adequate for slow periods may be entirely inadequate during "peak" business impact.

5. The frequency with which food stocks are delivered. Infrequent deliveries increase the need for larger storage facilities to back up daily service requirements.

With these factors in mind the food sanitarian must evaluate each establishment as a separate entity. However, there are some positive signs of inadequate refrigeration. One of the most obvious is overcrowding of refrigerator space. If reach-in coolers are used, the disorderly stacking of food, or, the placing of food containers one upon an other can usually be taken as a sign of space inadequacy. In the case of walk-in refrigerators, the close hanging of commercial cuts of meat and beef quarters can be taken as a sign that the cooler is too small for the amount of meat stored.

It is the common practice generally to check only the temperature of the atmosphere in refrigerators. While this is necessary and important, the use of a special thermometer that can be inserted in the stored food itself may be of considerable assistance in judging both the capacity and efficiency of refrigeration. This too is a valuable means of showing the proprietor or manager the necessity of placing food masses in low shallow pans rather than in deep stock pots and like containers. Even with an ambient of 40°F, food masses at the center remain at incubation temperatures for long periods and provide an opportunity for bacterial multiplication.

The food service establishment owner and manager should be instructed on the importance of low cold temperatures. He should be warned against allowing perishable foods to remain in warm kitchens and should be instructed to use refrigerated storage properly. Failure to use refrigeration correctly, the overcrowding of coolers, and the storage of large food masses in deep containers are the frequent cause of food borne illness. Since refrigerators are mechanical pieces of equipment and subject to break downs, deterioration and mechanical failure, each box should be provided with an accurate thermometer mounted in a protected place to minimize possible breakage. A refrigerator may warm to a temperature well above 40°F and not be noticed unless there is an accurate thermometer which can be checked at regular intervals.

INSTALLATION SUGGESTIONS

In most instances, best results will accrue if refrigeration loads are divided among units that are operated at or near the same storage temperature. Attempting to run both low and high temperature boxes from a single condensing unit, generally results in higher operating costs per ton of refrigeration.

Another important point is the quality of the refrigeration unit purchased. A high quality unit will hold temperatures more uniformily, resist corrosion and be more economical to operate. Small units should have aluminum, stainless steel or other rust resisting surfaces. Floors in walk-in coolers should be level with the kitchen or adjoining floor to permit wheeling in of barrels, heavy produce and meat containers.[2] The refrigerator should be lighted so there is 20 to 25 foot candles of light evenly distributed. Shelving should be removable to facilitate ease of cleaning. Bins should be on casters or rollers so they can be moved readily and so floor areas beneath can be maintained in a sanitary manner. Ultra-violet lights have little merit and they can in no way take the place of sound sanitation and low cold temperatures.

A SAMPLE REGULATION

In drawing a regulation on refrigeration as it applies to the food service business, several considerations may be taken into account. The first of course involves temperature, temperature maintenance, and proper use of facilities. It may be difficult to detail all conditions and circumstances surrounding the refrigeration of perishable foods. However, there are a number of salient points to be considered and the following, taken from the Department of the Air Force, Regulation No. 160-91[3], would seem to embody a number of desirable points.

REFRIGERATORS

Adequate refrigerator facilities will be provided all food service facilities and other food establishments to permit sanitary storage of perishable foods. Refrigerators and other cold storage facilities will be kept in a satisfactory state of repair and will be equipped with thermometers in working order. Storage shelves, meat hooks, food compartments, floor drains, and so forth, will be provided in refrigerators and cold storage rooms for the sanitary storage of perishables. Mechanical refrigerators and cold storage rooms will be operated at temperatures ranging within 35° to 40°F., depending on nature of foods stored, except that sharp freezers will be operated at temperatures not exceeding 0°F. Handles, doors, and the interior *of refrigerators, cold storage rooms, and ice chests will be kept scrupulously clean and free from odors. Storage shelves, food compartments, meat hooks and so forth will be kept clean. Food will not be placed in the same compartment with ice. No unwholesome food will be placed in refrigerators or cold storage rooms. Carcass meat received in bulk (unsliced) will be hung on hooks with proper spacing for ventilation. No food will be placed directly on the shelves and all food containers will be covered. Refrigerator circulating and blower units will be kept defrosted.*[3]

REFERENCES

1. Adams, H. S. Milk and Food Sanitation Practice. The Commonwealth Fund, 194.

2. Arnoff, M. Outlines Refrigeration Needs for Food Service Operators. Institution Magazine, March 1953. Domestic Engineering Co., 1801 Prairie Ave., Chicago, 1953.

3. Department of the Air Force, Air Force Regulation No. 160-91. Food Service Hygiene and Sanitation, June 1951. Washington, D. C.

AUTHORIZATION TO USE THE 3-A SYMBOL

Following is a list of concerns to which 3-A Symbol Council authorization to use the 3-A Symbol have been issued since publication of the list in the October 1958 issue of the Journal. This list supplements other listings published in earlier 1958 issues of the Journal.

AUTHORIZATION NUMBER	CONCERN AND ADDRESS	MODEL NUMBERS
	FITTINGS – SANITARY	
73	L. C. Thomsen & Sons, Inc. 1303 43rd. Street Kenosha, Wisconsin	Add: Lite-N-Tite Farm and Automotive Tank Outlet assemblies Nos. 3577, 3586, 3587, and 3589
	HEAT EXCHANGERS – RETURN TUBULAR	
96	*Henszey Company 202 North Water St. Watertown, Wisconsin	1-inch: 8′, 16′, 24′, 32′, 48′, 60′, 80′, 112′, and 156′ 1½ inch: 8′, 16′, 24′, 32′, 52′, 76′, and 96′
	HEAT EXCHANGERS – PLATE TYPE – 1100	
14	Chester-Jensen Co., Inc. 5th & Tilghman Sts., Chester-Jensen Co., Inc.	Add: HM-C, HT-C, and HM-E
	PUMPS – ROTARY	
52	Viking Pump Company Cedar Falls, Iowa	Add: J-7171A, K-7171A, KK-7171A, L-174A, and L-7171A
	PUMPS – 0201	
63	Creamery Package Mfg. Co. 1243 W. Washington Blvd. Chicago 7, Illinois	Add: 2, 2F, 3, 3F, 3T, 3FT, 4 and 6.
	ELECTRIC MOTORS – 0600	
77	Electra Motors, Inc. 1110 North Lemon Street Anaheim, California	Add: 66-6112-S, 184-6112-S, 213-6112-S, and 215-6112-S
	HOMOGENIZERS – 0400	
75	Manton-Gaulin Mfg. Co., Inc. 44 Garden Street Everett 49, Mass.	Add: DJ-3, DJ-7, M18, M30, M45, and M75
	EVAPORATORS AND VACUUM PANS – 1600	
110	Arthur Harris & Co. 210-18 North Aberdeen St. Chicago 7, Illinois	No model numbers
	TANKS – AUTOMOTIVE – 0502	
98	Beseler Steel Products, Inc. South Limits Road Marshfield, Wisconsin	BPT-58

25	Walker Stainless Equipment Co. New Lisbon, Wisconsin	Add: BPC-158R and BPC-1158R
	TANKS — FARM — 1300	
99	Henry C. Bergmann, Inc. 5601 E. Imperial Hwy. South Gate, California	RRB, BC, and HT
95	Globe Fabricators, Inc. 7744 Madison St. Paramount, California	R and RB
50	Emil Steinhorst & Sons 612-616 South Street Utica 3, New York	Add: E:18 and 24: E:26, 36; W:18, 26; LN: 30, 40, 50, 60 Models: L: 15, 20; LS-15; WS: 2,3,4; and E-24 discontinued
18	Whirlpool-Seeger Corp. changed to: Whirlpool Corporation same address	Add: MC-155 PX, MC-210 PX, MC-255 PX, MC-310 PX, MC-415 PX, MC-545 PX, MC-625 PX, and MC-735 PX
33	Cherry-Burrell Corporation 2400 Sixth St., S.W. Cedar Rapids, Iowa	Add: FTM-400D, FTM-400, EOD, FTD-90-D, FTD-90-EOD, FTD-150-D, FTD-150-EOD. Models FTM-385-D, FTM-385-EOD, and FTM-120 EOD discontinued.
36	Craft Manufacturing Co. 3949 W. Schubert Ave., Chicago moved to: 2301 Davis St., North Chicago, Illinois	Add: CM 100, 150, 200, 250, 300, 400, 500, 600, and 800
4	Dairy Equipment Company 1444 E. Washington Ave., Madison 2, Wisconsin	Add: DKS: 400R, 500R, 800, and 1250
49	DeLaval Separator Company Poughkeepsie, New York	Add: D: 250, 375; DA: 80, 250, 375; DVA: 375. DR: 375. R: 500, 600, 800 and 1000 Discontinue: DVA: 375 DR 375, R-500, R-600 Add: D-500, DV-375, DRB:180 250, 375, 500, 600. DRS: 200, 300, 400, 500
92	The DeLaval Company, Ltd. Peterborough, Ont.	Discontinue 300 and 375 Add: 90, 320 and 400
48	Metal Products Co. 222 W. Deway, Wichita, Kansas moved to: 4219 Irving, Wichita, Kansas	
12	Paul Mueller Company Kansas at Phelps Street Springfield, Missouri	Add: "M": 150, 200, 250 300, 400, 500, 600, 700 800, 900, 1000, 1250 1500 and 2000 gal. "MS:" 150, 200, 250, 300 gal. "P.S." 90 gal.
61	Sani-Kool Div. James Mfg. Co. 104 W. Milwaukee Ave. Ft. Atkinson, Wisconsin	Add: FK: 600, 800 EOD, SK: 400 and 500.
	Tanks - Storage	
97	Beseler Steel Products Inc. South Limits Road Marshfield, Wisconsin	ST-56
	TANKS — STORAGE — 0101	
31	Walker Stainless Equipment Co. Elroy, Wisconsin	Add: HHT: 1000-10000; HHT: 1000R-10000R; HET: 750-3100 RT: 1000-10000 RT: 600R-6000R VHT: 800-1800

56	Houston Fearless Corporation 11801 West Olympic Blvd. Los Angeles 64, California Authorization not renewed because fabrication of farm tanks discontinued.	
	BULK MILK DISPENSERS — #1500	
23	Monitor Process Corporation 192 Bright Street Jersey City 2, N. J. changed to Monitor Dispenser Co., Inc. 22 Depot Square Montclair, N. J.	No change in model numbers
	EVAPORATORS & VACUUM PANS — #1600	
111	Dairy Equipment Div.-Blaw-Knox Co. Mora, Minnesota	D–60–R and D–60–IR to D–600–R and D–600–IR
	FITTINGS—SANITARY PIPING — #0800	
86	Waukesha Specialties Co. Walworth, Wisconsin	Add: 60TMRL 60YMRL
	TANKS — FARM — #1300	
55	Haverly Equipment Div. — John Wood Co. First Street Royersford, Pa.	Add: HB: 100 and 1005
112	Nichols Refrigeration Co. P. O. Box 127 Medina, Ohio	BT: 31, 51, 52, 72, 73, 103, 104, 254, 255, 275, 2106, 2107, 2108. DBT: 3, 4.
	TANKS — STORAGE — #0101	
28	Cherry-Burrell Corporation 501 Albany Street Little Falls, N. Y.	Discontinued: DHP, DHS, DHCW, DVP, DVCW, R, and RW.

NEWS AND EVENTS

QUESTIONS AND ANSWERS

Note: Questions of technical nature may be submitted to the Editorial Office of the Journal. A question in your mind maye be in the minds of many others. Send your questions in and we will attempt to answer them.

QUESTION:

We have noted that smoked fish of the carp family which is on sale in our local area occasionally has considerable mold on it. The fish is wrapped in a flexible plastic package. We have noted that other dried fish not wrapped in such a package seldom mold. Is the presence of the mold indicative of a controllable unsanitary practice?

ANSWER:

The presence of the mold in a plastic wrapped package of smoked fish is probably the result of the build-up of sufficient moisture in the package to favor the growth of the mold spores. Smoked carp has a moisture content of about 18-27 per cent and a salt content of 6-9 per cent. This gives a salt/water ratio of 0.33. Normally, any moisture loss in unwrapped fish is dissipated atmospherically. If the overwrap is of such characteristics that the moisture is not dissapated at all, or too slowly, then the conditions of humidity within the package are such that mold growth will be favored. The presence of the mold is also evidence of absence of a mold inhibitor. The control of the mold would include, of course, improved conditions of handling of the dried fish at the time of wrapping, protection of the wrappers, and, in effect, all procedures that would exclude mold from the packaging operation such as is used in packing pre-sliced cheese. The packaging material probably should have a relatively high water vapor transmission rate to accommodate the movement of moisture. Refrigeration of the packaged fish will probably help in minimizing the mold growth.

QUESTION:

We are interested in the conditions which would be necessary for transhipment of pickle relish in bulk from one plant to another, at ambient temperatures. Is there a condition by which the relish can be conveniently moved without danger of spoilage?

ANSWER:

This problem frequently arises in planning utilization of certain types of pickled products. Normally, it might be advisable to recommend a hot bulk packaging of the product in bulk flexible bag containers which can be sealed and transshipped from one place to another. If the "raw" product is to be repacked or reprocessed, the second heat treatment may be harmful to its quality acceptance. In this case, refer to the work of Bell and Etchells (Food Technology, **6**: 469. 1952). In this study, it was found that yeast spoilage in pickles could be prevented by maintaining a concentration of acetic acid above certain minimums for different levels of sugar concentration. The minimum values follow a line that plots essentially as follows: (% acid = a; % sucrose = b). a = 1.0 and b = 60; a = 2.5 and b = 30; a = 3.5 and b = 10. The per cent acid is expressed as acetic acid. The values represent the concentrations of acid and sugar equilibration of the concentrations of the acid and sugar are greater than those indicated, then reasonable protection against spoilage by yeast fermentation may occur. The product probably should be well packed to exclude air to minimize possible surface growths.

3-A COMMITTEES AGREE ON REVISED FARM TANK STANDARD, OKAY FITTINGS REVISION AT EVANSTON SESSIONS

Final agreement on a revision of the 3-A Sanitary standards for Farm Holding and Cooling Tanks was reached by conferees at the regular semi-annual meeting of the 3-A Sanitary Standards Committees, February 24-26, at the Georgian Hotel in Evanston, Illinois.

The farm tank standard was first published in 1953, and at present, 33 manufacturers of farm tanks are authorized to place the 3-A Symbol on their tanks, indicating their product complies with the published 3-A Sanitary Standard. The revision of the five-year-old standard chiefly concerns a modernizing of the provisions for vacuum tanks and the cooling performance of all bulk milk tanks.

Official signing of the revised standard will occur in the next few months, and publication of it is expected to occur before the end of the year in the Journal of Milk and Food Technology. Following the publication of a 3-A Standard, manufacturers customarily have a period of 12 months to conform to the new standard (or else to discontinue using the 3-A Symbol on their equipment).

The agreement on the farm tank standard was probably the most important result of the semi-annual gathering of 3-A Committees in Evanston, which more than 100 attended. Represented were sanitarians, dairy processors, dairy industrial supply and equipment manufacturers, and the U. S. Public Health Service. Observers from the U. S. Departments of Agriculture and Defense also attended.

Conferees also approved an amendment to the 3-A Sanitary Standard for Fittings, first published in 1950. The amendment provides for non-metallic sealing surfaces in certain types of sanitary valves, thus making available an alternate material to stainless steel in some sanitary valves. This amendment is also due to be published within the next few months in the Journal of Milk and Food Technology.

Among other agenda items which moved into advanced revisions, and thus nearer to completion, were tentative standards for ice cream filling equipment, cottage cheese filling equipment, plastic material and sanitary specifications for rubber.

The next meeting of the 3-A Sanitary Standards Committees will be held in Glenwood Springs, Colorado, August 22-25, 1959.

VICTOR M. EHLERS PASSES

Victor M. Ehlers, Director, Division of Sanitary Engineering, Texas State Health Department, died at Austin, Texas, on March 20, 1959 ending a long and distinguished career in the field of sanitary engineering and public health. "Vic", as he was known to his host of friends and professional associates, was among the pioneers who campaigned for improved environmental health in the areas of water, sewage, milk and food and industrial wastes.

He was born in Bastrop County, Texas in 1884. In 1905 he graduated from Texas A. & M. College with a B. S. degree in civil engineering. In 1910, after work in his chosen field, he received the degree of C. E. from Cornell University. In 1915 he ccepted the position of Chief Sanitary Engineer with the Texas State Health Department, the position he held at the time of his death.

During his career he was the recipient of numerous honors for excellent service and gained prominence, not only in his home state, but as an authority on public health engineering matters throughout the United States, Canada and the Latin American Countries.

In collaboration with Ernest W. Steel, Professor of Sanitary Engineering, University of Texas, he published a well known and widely used textbook, *Municipal and Rural Sanitation, the* fifth edition of which was issued in 1958.

"Vic" Erlers was president of the International Association of Milk and Food Sanitarians in 1939 and always took an active interest in the growth and development of the Association. Some of his early outstanding work was done in the field of milk control in Texas. He was truly one of the "Elder Statesmen" in the field of environmental sanitation and his work and courage greatly influenced many of the reforms which have become a reality during the past several decades. His passing is a great loss but his living deeds and accomplishments are monuments to him.

FOOD ADDITIVES AMENDMENT, 3A STANDARDS, LABELING DISCUSSED AT DPII MEETING

Paper on Uniform Score Sheet and Milk for Manufacturing Presented

The Food Additives Amendment, 3-A Sanitary Standards, and Uniform Labeling were among the subjects discussed at the Dairy Products Improvement Institute meeting February 19, 1959. Also included in the program was a paper on quality considerations for milk to be used in manufacturing and a final report on the Northeast's approved uniform industry score sheet.

This, the twelfth annual meeting for the Institute, was held at the Hotel Governor Clinton, New York, N. Y. Over 230 members, regulatory officials, educators, and industry representatives attended the one day session.

The Institute's president, A. C. Fisher, Sealtest Foods, Metropolitan Division of the National Dairy Products Corporation, who presided during the meeting was reelected to serve another year. Reelected vice president was Dr. William C. Welden, H. P. Hood & Sons, Boston, Massachusetts. Robert H. North, Executive Secretary of the International Association of Ice Cream Manufacturers was reelected treasurer, and Dr. A. C. Dahlberg, Cornell University was reelected secretary. Donald H. Race was reappointed field director.

Following a noon luncheon Winton B. Rankin, Assistant to the Commissioner of the U. S. Food and Drug Administration discussed the recently enacted Food Additives Amendment, especially as it applies to dairy products and additives. The paper was prepared by FDA Commissioner George P. Larrick who was unable to attend the meeting due to illness.

The Northeastern industry's recently approved uniform dairy farm score sheet was presented by Dr. R. W. Metzger, Director of Quality Control, Dairymen's League Cooperative Association, Syracuse, N. Y. Dr. Metzger is president of the New York State Association of Milk Sanitarians.

Dr. Richard M. Parry, Chief of the Dairy Division, Connecticut Department of Agriculture followed with a discussion of committee activities on uniform labeling of milk and selected milk products.

E. Small, Head of the Standards Section, Dairy Division, U.S.D.A. presented a paper on "Quality Considerations For Milk To Be Used In The Manufacture of Dairy Products." Mr. Small explained the USDA's plan to prepare minimum specifications for Dairy farms producing such milk.

Final speakers on the program were Professor Ivan E. Parkin, The Pennsylvania State University, and Benjamin G. Habberton of Washington, D. C. who presented a joint discussion of the 3-A Sanitary Standards from the standpoint of the purposes and present status and the legal aspects respectively. Co-author of Mr. Habberton's paper was Charles M. Fistere, who was general counsel for the Dairy Industry Committee, parent organization of the Sanitary Subcommittee.

The morning session was devoted to committee meetings and a general business meeting for members. Elected to the Board of Directors to serve until 1962 were Ernest Kellogg, Milk Industry Foundation, Washington, D. C.; E. J. Roberts, Crowley's Milk Company, Binghamtom, N. Y.; Fred E. Uetz, Pioneer Ice Cream Division, The Borden Co., Brooklyn, N. Y.; and John M. Martin, Hovey, Stanter & Co., Inc., New York, N. Y. Howard W. Stuckeman, Sealtest Foods, Pittsburgh, Pa., was elected to serve the unexpired term of the late A. J. Lucas, The Isaly Dairy Co., Pittsburgh, Pa.

INDEX TO ADVERTISERS

INTER-AMERICAN FOOD CONGRESS TO BE HELD IN JUNE

Food technologists from the United States and U. S. Department of Agriculture officials will present a bilingual program, through the medium of simultaneous translation, made popular at the United Nations, for Latin American government officials, food industry representatives and their guests from 17 countries at the annual Inter American Food Congress to be held at the Carillon Hotel, Miami Beach, Florida, June 9 - 13th, 1959. The Congress is sponsored by The Inter American Food Institute, a non-profit corporation designed to assist the Latin American food industry.

The purposes of the institute are to promote, through a scientific, non-political effort, effective cooperation and exchange of ideas and information among the peoples of South America, Central America and countries of the Caribbean area, relative to technical and scientific advances pertaining to the production, processing, packaging, quality control and marketing of food and food products.

Latin Americans from every type of food industry will be in Miami Beach to learn our latest advances in bio-chemistry, chemistry, microbiology, enzymology, and the nutritional aspects of meat, poultry, fish, fruit, vegetable, cereal, confections and dairy products, as well as processing and packaging methods, quality control, grading and marketing. Special sections will be devoted to each of these subjects.

Major manufacturers in the food field will exhibit their products at the congress for the inspection of the Latin Americans who will attend. Some very interesting and beautiful exhibits are being arranged by such firms as, Continental Can Corp., Food Machinery International, Products De Mais, Mexico, Fritzche Brothers Inc. etc.

Because of the desire of our government to cooperate with the Latin Americas to improve their standards of living, and because of the tremendous investment of private U. S. capital, (over 9 billion dollars in 1958) the institute is certain that American industry will find ready markets for its products in a revitalized Latin America.

CORNELL PLANS CONFERENCE ON MILK FLAVORS

A two day conference on milk flavors will be offered on May 5 and 6 at the Department of Dairy Industry, New York State College of Agriculture, Cornell University.

The program will consider such off flavors as, Barny and Feedy, Rancid, Oxidized, Malty, Fermented and Sour. Types of flavor removing equipment and ultra-high temperature processing will also be discuessed. The effects of steam injection systems and vacuum systems will also be considered.

Registration is limited to 125. Persons planning to attend should send registration requests to Dr. Frank Shipe, Department of Dairy Industry, Cornell University, Ithaca, New York.

URBAN SPRAWL AND HEALTH

A 228 page, 8½ x 11 report of the 1958 National Health Forum was released today by the National Health Council.

The 1958 Forum was both timely and important. Under the chairmanship of Dr. Abel Wolman, Professor of Engineering, Johns Hopkins University, and co-chairmanship of the Honorable Frank C. Moore, President of the Government Affairs Foundation, the Forum brought together, for the first time, various professions and special interests for a unified examination of the problems of urban sprawl and their ramifications.

The forum discussions were planned to analyze the health implications of urban sprawl and to identify what might be done to improve personal, family and community health in the exploding metropolis. The report of the three days of discussions, led by more than 60 leaders in city and regional planning, public administration, and health reveals the wide-ranging complexities of the problem.

The 1959 Forum report — Urban Sprawl and Health — is available ($1.75 per copy) from the National Health Council, 1790 Broadway, New York 19, N. Y.

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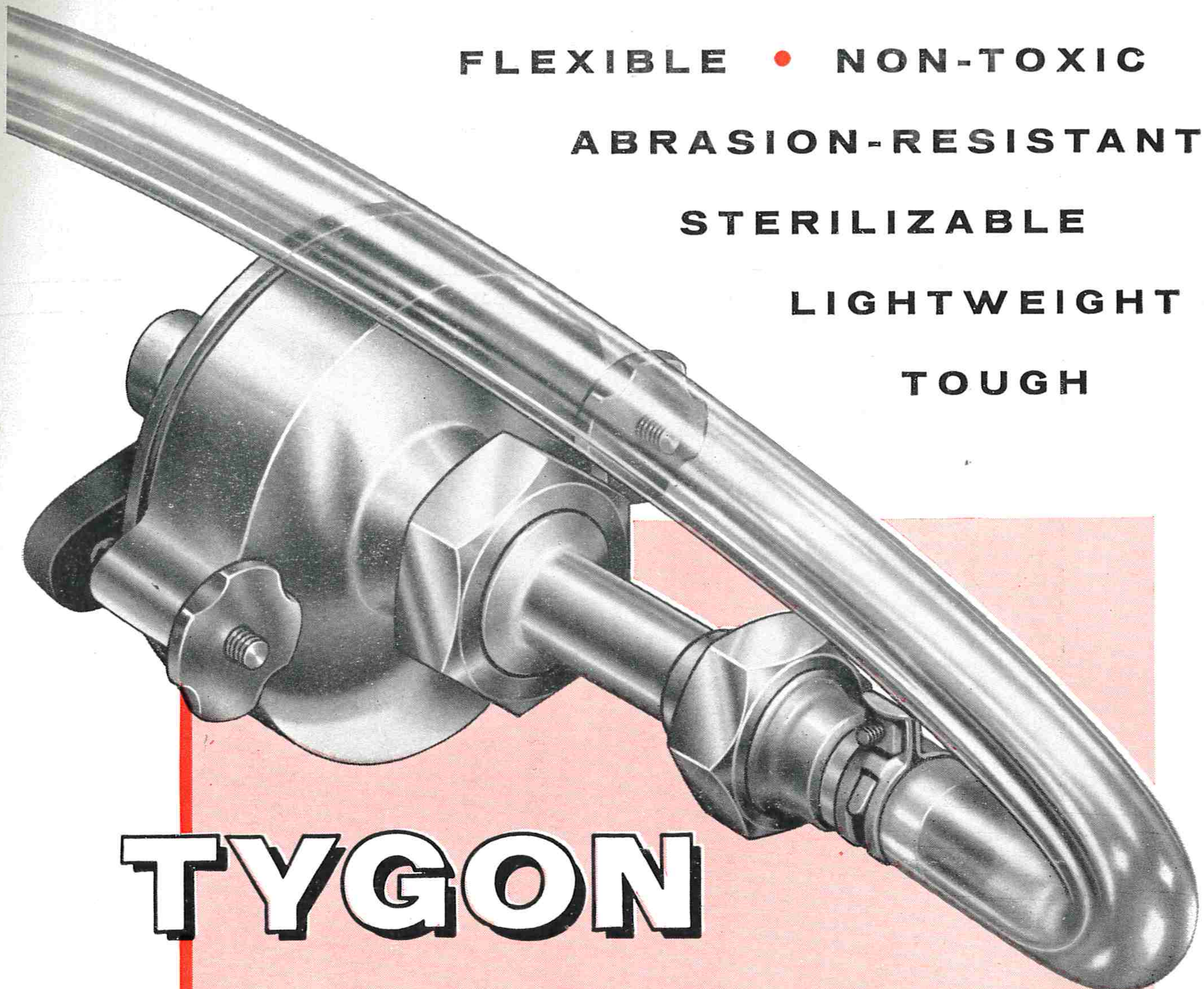

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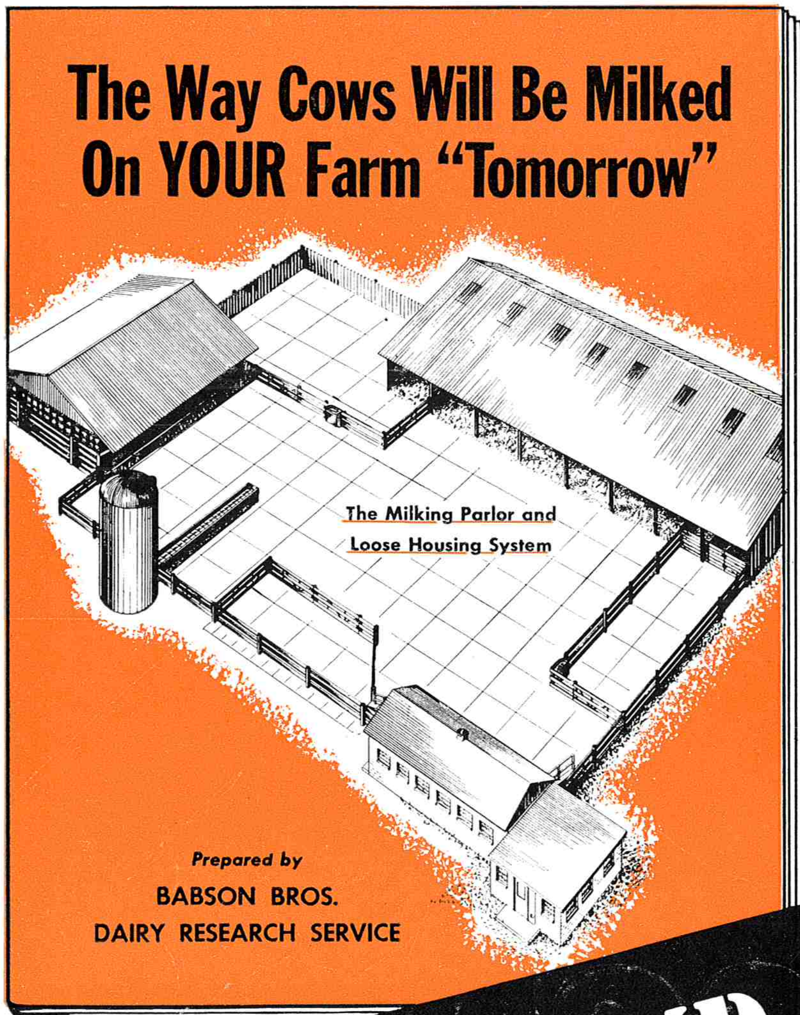

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