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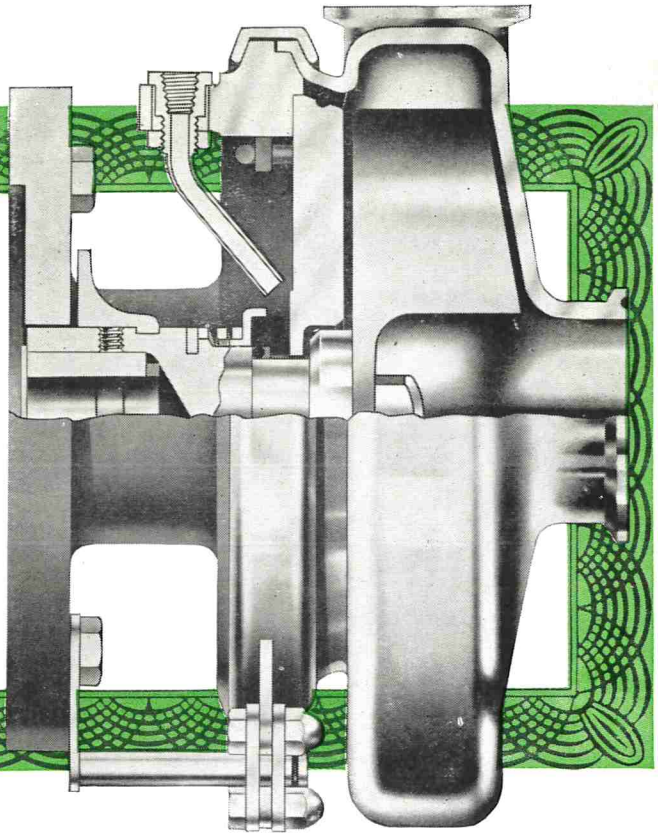

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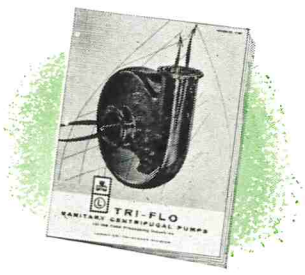

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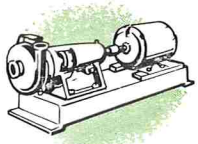

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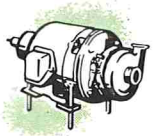

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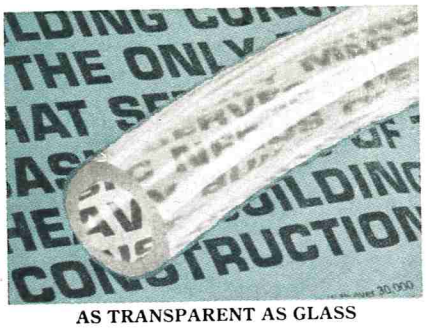

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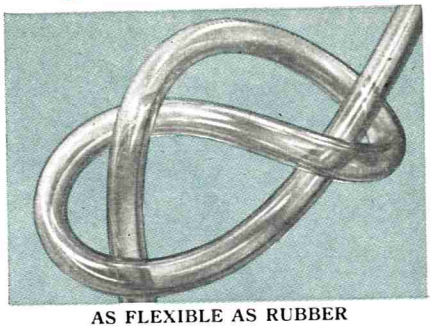

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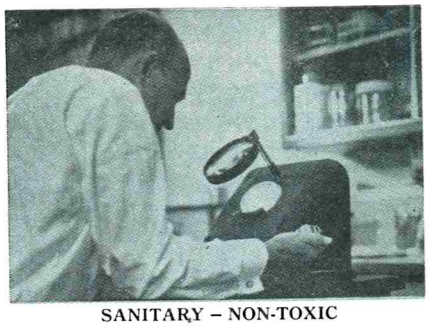

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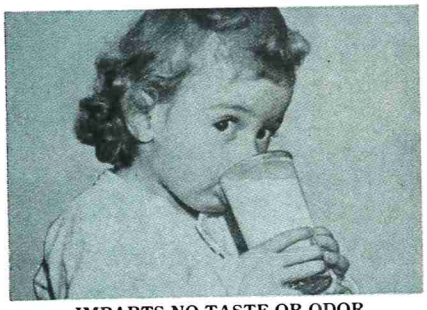

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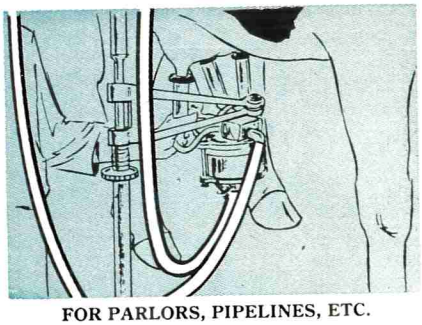

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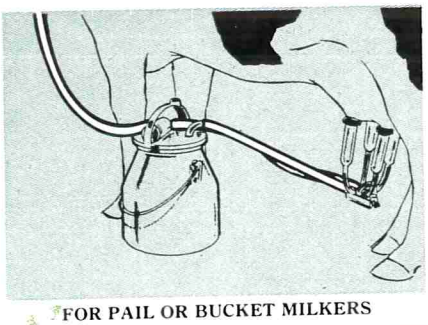

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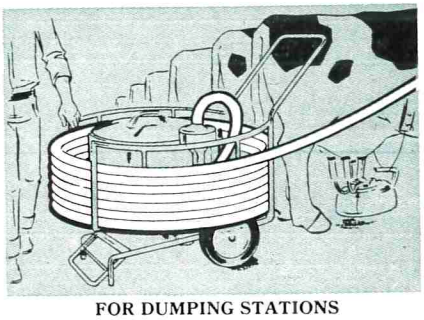

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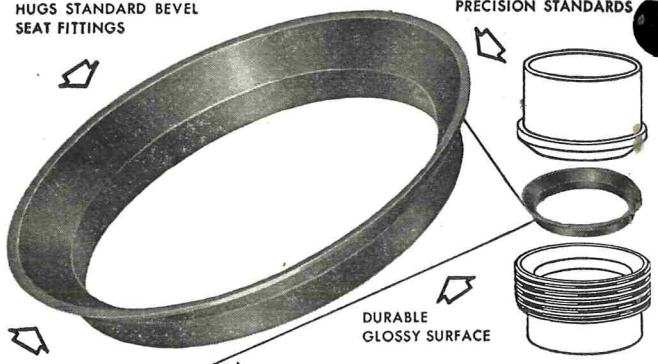

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ESTABLISHING PRINCIPLES AND TRAINING FOR INTERNATIONAL FOOD DEVELOPMENT[1]

FRANK KOSIKOWSKI

Department of Food Science
Cornell University, Ithaca, N. Y.

There are many who believe the world faces a critical food shortage during the next quarter century when, as predicted, its present 3.1 billion population will soar to over 6.0 billion. Some suggestion of this problem's seriousness is apparent in recent assertions by the United States Department of Agriculture that our country cannot provide the expanding food needs of its allies beyond 1980 unless food production is increased significantly abroad. Such a direct challenge must claim the attention of thinking Americans, and, for that matter, Europeans, not just for the moment, but over many years to come. For, reminiscent of Lady Macbeth's exclamation, "Out, out, damned spot," a dark spot remains in world food supplies and may become just as difficult to remove.

The American is often divided between his generosities and his procrastinations, the one fostered by an active conscience, the other influenced by a fear of being taken for a dupe. But unless broad plans are acted on soon, the costs of supporting the hungry part of the world will become so staggering as to make him forget about the niceties of his position. It is apparent that we, as a nation, need to acquire an understanding and appreciation of the forces that effect food production and processing in less fortunate countries, and to select and train scientifically oriented young men and women for effective leadership in international food development.

The role of the American university.

In the ever increasing critical matter of preventing starvation, the role of the universities is very important. It goes to the very heart of the reasons for their existence, the search for truth, and the dissemination of knowledge to lighten the load of mankind.

Demonstration of leadership for creating adequate world food supplies is evident among our nation's universities. In many United States land grant universities it has taken shape through the establishment of International Agriculture Development centers.

[1]Presented in part by the author at the Food Science Seminar, Pennsylvania State University, University Park, Penna., April 6, 1966.

Figure 1. An outside guest lecturer presenting his views on International Food Development. J. Mittaine, Roquefort Association, Paris France.

The framework for action is thus apparent, but the mode of attack which would give the best results is not so clear. For example, many questions arise. What type of a program must a university conceive to attract gifted students, particularly Americans, for eventual service overseas in food development? Once attracted, what type of training will give the students effective tools and incentive to cope with complex development? Are there specific International Food Development principles and, if so, how are they distinguished from superficial, passing innovations? Can an international career philosophy be created among Americans in a manner calculated to give technical excellence? How do we establish the student once he has received training?

Some exposure abroad to development projects convinced your speaker that our interested students must obtain more than a superficial knowledge of international food development, that they must learn what makes development programs work or fail, and that they must become acutely aware of the problems, the opportunities, and the nature of peoples involved. In this way, such students are better prepared to conduct necessary projects in a professional manner.

It is said that random thoughts often set the stage for specific action. The College of Agriculture at Cornell University proved the validity of this point

by approving in 1965, as a part of its over-all program, a new course dedicated to the above principles, entitled "International Food Development."

Dairy and Food 440 - International Food Development.

The new course is described in the college catalogue as follows:

"A study of programs, technical problems, and progress associated with developing acceptable food supplies in critical world areas. Plans for increasing world protein resources for the human are to be discussed. Special attention is to be directed to the organization, operations, relationships, and contributions of U. N. technical agencies, FAO, UNICEF, WHO, and non-governmental and governmental organizations in the field."

In its presentation, this 3-credit course was given two days weekly with each period covering two hours. The first 55 minutes of each meeting was devoted to a formal presentation, Table 1, followed by a short coffee break, and the last 55 minutes was set aside for informal discussion between speaker and students and between students. A number of outstanding speakers with broad experience in developing world areas and international agencies were invited to assist the resident lecturer. These included representatives of the United States Department of Agriculture, the Food and Agriculture Organization of the United Nations, the World Bank, private industry, and the College of Agriculture, Table 2. Each lecture was integrated and oriented to give a definitive continuity so that the course had a forward movement with a beginning and ending and a substantial middle, and was not simply a series of seminars.

TABLE 1. LECTURE OUTLINE IN INTERNATIONAL FOOD DEVELOPMENT

Lecture No.	Lecture - Discussion
1	Food, Man, and the World Around
2	Properties of Milk and Basic Milk Products
3	Properties of Basic Foods
4	Area Importance of Basic Foods
5	Milk Production under Primitive Conditions
6	International Agencies in Food Development
7	Organization and Operations of F. A. O.
8	Programs and Problems of UN Technical Agencies
9	Activities of Non-Profit Foundations and Universities in International Food Development
10	Contributions to Progressive International Food Development by Private Enterprise
11	Spoilage of Foods
12	Preservation of Foods
13	Foods from the Sea
14	Foods from Algae and other sources
15	The Food Technology of Latin America
16	Food in East Africa
17	Food in the Mediterranean and Near East
18	Potential for Food Development in the Mediterranean and Near East
19	Food of Pakistan and India
20	Challenges Facing Pakistan and India in Food Development
21	Food Development Characteristics of Far East. Visit to Food Science and Technology Department, Geneva, New York
22	Conceiving and Planning International Food Development Projects
23	Conceiving and Planning International Food Development Projects
24	The Machinery of Financing International Food Development
25	The Financing of International Food Development. Problems, Prospects, and Programs
26	Establishment of Principles for International Food Development
27	Careers, New Challenges, and Dimensions

TABLE 2. OUTSIDE LECTURERS AND DISCUSSION LEADERS FOR INTERNATIONAL FOOD DEVELOPMENT

E. J. Siegenthaler—Former resident of Switzerland. Consultant to the F.A.O. with 5 years in field in Guatemala, Jordan, and Nepal. Presently Research Associate at Cornell University. Lecture 5.

R. W. Phillips—Director, International Organizations Staff, Office of Assistant Secretary, Department of Agriculture, Washington, D.C. Member of the Council of the F.A.O. Lectures 6 and 7.

J. Mittaine—Vice president, Roquefort Association, Roquefort, France. Graduated as mining engineer, Ecole Polytechnic, Paris. Engineer in French coal mines, army officer, business man, and technical consultant on food development in Europe, Asia, and Africa. Lectures 17 and 18.

E. O. Anderson—Director of Milk Quality Improvement, State of Connecticut. Retired University of Connecticut professor. Four years experience in Europe and six years in Pakistan and India under U. S. State Department technical programs. Lectures 19 and 20.

H. Stack—Attorney, Genoa, New York. Cornell graduate, College of Agriculture. Initiated program leading to establishment of sugar beets in Cayuga County, New York, and to automated sugar processing facilities near Auburn, New York. Lecture 23.

Tom Noonan—Official of World Bank, Washington, D.C. Specialist on the structure of the Bank, its functions and programs. Lectures 24 and 25.

Remaining lectures given by Cornell University Staff: F. V. Kosikowski, Lectures 1, 2, 3, 4, 8, 10, 11, 12, 13, 14, 15, 22, 26, 27; K. L. Turk, Lecture 9; R. F. Holland, Lecture 16; and D. B. Hand, Lecture 21.

There were no required textbooks, but there was much required reading. Standard texts have yet to be written on this subject as an academic discipline, but many books covering some portion of the

general area were available. Among the 26 sources utilized for outside reading (note Bibliography Section), several received particular attention. They were, "Humanity and Subsistence," proceedings of a symposium, Annales Nestlé, Vevey, Switzerland, 1960, and "Population and Food" by Cépède, Grond, and Houtart, published by Sheed and Ward, New York, 1964.

Originally intended for dairy and food science senior undergraduate and graduate students, the course was oversubscribed, in addition, with students from the arts and the engineering colleges. Also, about five housewives attended the lecture regularly, as did one beagle hound. The students, some of whom were majoring in sociology, economics, and entomology, represented 14 countries, and included three former Peace Corpsmen among their ranks. It aptly demonstrates that the field of food science has interest to a general audience.

A happy note was the intense personal participation of most of the students in the informal discussion period. These spirited discussions, often extending an hour longer than scheduled, usually had to be terminated abruptly by the instructor because the thermal capacity of the room had been over-extended and there was no pressure safety valve.

One reason for establishing this course was to give the student an appreciation of the enormous problems facing international food development. He learned, for example, of birth control attitudes and their pertinence to food supplies, of spoilage losses of food and means for control, of the problem of milk production in primitive areas, of the role and sources of credit, and of the international opportunities for qualified students.

Another basic reason was to ascertain and define principles of international food development. This was left for the students to cope with in the latter stages of the course by requiring from each a term paper on the subject, "Principles of International Food Development." Some of the considerations which emerged included the following:

"Education is the first requirement for development."

"Field projects must start on a small, controllable scale."

"Nationals of developing countries must be made partners in projects."

"Projects successfully launched must be turned over to nations in due course."

"Proper credit lines must be established."

"Training of leaders must combine scientific and technical know-how with broad understanding of human behavior."

Acquiring experience.

It is a relatively easy task for a university to expose its students in the classroom to the experience of others in international food development, but it is not so easy to give the student first-hand contact with the realities of development. How then should an interested student gain sufficient direct experience at an early stage in his career to make him useful in project development and, equally important, to enable him to realize whether or not an international career suits him?

Programs which permit the young, technically qualified student to become actively engaged in international food development before he accepts it as a career should be encouraged. For example, he might be sent to administrative and field areas of international organizations engaged in such development. Here he could observe planning and supervision of projects. In turn, the intelligent, dedicated student could lighten the work load of overworked technical officers in these organizations by assisting in routine duties and paperwork, allowing the latter to concentrate on the tasks which demand their highly technical skills.

Several broad trainee programs for fitting technically trained college students into existing international organizations' administrative and field units for one-year periods are now under consideration.

The role of the student in the fight against starvation.

It has been amply demonstrated that a number of young men and women with special technical skills are willing to make a life career in international food development. But more students in the United States and other developed countries must become imbued with this spirit, and to become effective in this work, they must acquire the tools of modern day science.

It was J. R. Enderle who said "Food development on an international scale will become a dynamic force only when knowledgeable people in the area of food production and processing gain an appreciation for the plight of the underfed and then establish a set of principles to guide themselves in carrying out the development project." Who was Enderle? Why, he was a student in the new course at Cornell University and the quotation comes from his term paper.

In summation, we have a role like the Romans in 200-100 B.C., but directed toward a more noble cause. Their objective was the conquest of peoples; ours the conquest of hunger. Governments and universities, citizens and students, they all have a valuable contribution to make, and it must be made with

verve, with intelligence, with compassion, and with knowledge of the natural forces at work. Time is beginning to run out; one can almost hear the grains of sand slipping through the hour glass.

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MEETING ON SALMONELLOSIS FROM A FOOD INDUSTRY STANDPOINT

The Western New York Section of the Institute of Food Technologists, in cooperation with the U. S. P. H. S. Communicable Disease Center, will hold a one-day meeting on problems of salmonella in food supplies. The meeting will take place on November 17, 1966, at the New York State Agricultural Experiment Station, Geneva, New York. The program will include a short history of salmonellosis in food supplies, a discussion of salmonellosis from the food industry viewpoint, a paper covering current research on laboratory techniques, and a discussion of methods of eliminating salmonellosis in food supplies.

The program is open to all research and control personnel interested in salmonella in food supplies. For further information, contact Dr. Frank E. Weber, The R. T. French Company, 1 Mustard Street, Rochester, New York 14609.

NEW BROCHURE COOPERATIVE PROGRAM FOR MILK CERTIFICATION

The Public Health Service has just released a revised brochure "Grade 'A' Pasteurized Milk—Safe and Reliable". The new brochure describes concisely the history of the Cooperative State-PHS Program for Certification of Interstate Milk Shippers, the manner in which the program operates, and its growth, benefits, and accomplishments.

The underlying purpose of the Grade "A" Pasteurized Milk program is stated and the development and operation of the Certification system is reviewed. Benefits to both milk exporting and importing states and especially to the consumer are enumerated briefly.

The brochure is designed for distribution in the promotion of Grade "A" Pasteurized Milk programs. Copies are available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20420, at five cents per copy or in quantity lots at $3.75 per 100 copies.

USE OF SANITIZERS IN PREVENTING INTRA-MAMMARY INFECTIONS[1]

C. K. Johns

Lazarus Laboratories, Inc.,
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In "Current Concepts of Bovine Mastitis" *(9)* we read, "The purpose of any sanitary program is to prevent or minimize the spread of organisms from infected to non-infected cows and to reduce the chance of infection by organisms inhabiting the immediate environment or skin of the cow." For a sanitary program to be effective we must have a clear idea as to where these organisms come from, and since staphylococcal mastitis is the chief concern in most areas today, we will concentrate mainly on it. Excluding the interior of the udder, the two main reservoirs of mastitis staphylococci are the skin of the teats and the teatcups of milking machines *(17)*, with the milkers' hands a third important source. The number of these organisms transferred from the teat skin to the inflation is often extremely high. Newbould and Barnum *(13)* recovered over 50,000 per inflation by swabbing *after* dipping them for an unstated period in 250 ppm hypochlorite! Naturally, the chances of infection increase as the number of bacteria entering the teat duct increases. This is clearly shown in Table 1. So while no program of sanitation can guarantee complete destruction of mastitis organisms, it is surely common sense to try to keep their numbers down to a minimum.

Table 1. Experimental Inoculation Of Teat Ducts With *Staphylococcus aureus*[a, b]

Approx. no. *S. aureus*	No. of ducts inoculated	No. of quarters from which staphylococci were isolated from foremilk for the following number of milkings: 0	1	3	5	7	9	11	13
10	2	2							
100	24	6	7	5	2				4
1000	31			3	9	7	6		6

[a]Small numbers of S. *aureus* were inoculated into the outer 4 mm of the teat duct once only, immediately after the evening milking.

[b]From data of Newbould. 1964. Ph.D. thesis, University of Reading, England.

[1]Presented at the 5th Annual Meeting of the National Mastitis Council, Chicago, Ill., February 3, 1966.

Recommended Sanitary Procedures

To minimize the transfer of mastitis organisms from diseased to healthy udders, four steps are currently recommended: *(a)* disinfection of milkers' hands, *(b)* udder washing and disinfection, *(c)* disinfection of teatcups, and *(d)* teat dipping after milking. Each of these will now be considered separately, although they work together in a complete mastitis program.

Disinfection of Milkers' Hands.

Mastitis organisms, especially staphylococci, can nearly always be isolated from the skin of the udder and teats of infected cows. It has been estimated that 50% of the cows in the United States are infected with pathogenic organisms in an average of two quarters *(9)*. Obviously it is good practice to handle the skin as little as possible. It is not generally appreciated by the producer that skin is extremely difficult to sterilize, even when the hands are immersed in an efficient disinfectant solution. Nevertheless, this practice should reduce to a marked degree the number of mastitis organisms on milkers' hands and thus lessen the chances of infection being spread. The detergent/sanitizers found most suitable for washing and disinfecting udders should be equally effective here *(10)*.

Udder Washing and Disinfection.

This operation should remove dirt from udder and teats, remove or destroy a high percentage of mastitis organisms present, and stimulate "let-down" of milk. Unfortunately, as commonly carried out, this operation is more likely to spread mastitis organisms than to control them. Too often a pailful of sanitizing solution of an unsuitable type, or just plain water, is used to wash far too many cows. Using the same cloth or sponge to wash a series of cows is a sure way of spreading mastitis organisms, yet the 1964 survey by Hoard's Dairyman *(3)* revealed 40.6% of over 2,000 dairy farms using a household rag, and another 37.1% a sponge for this purpose! No wonder some authorities question the desirability of washing udders.

Properly carried out, udder washing can aid in controlling mastitis. First, a suitable product should be chosen. For many years a strong hypochlorite

solution was widely recommended, presumably because hypochlorites are effective sanitizing agents in the absence of organic matter. Controlled studies in Canada *(12, 13)* and in England *(5, 6)* have shown chlorhexidine, and an iodophor, to be very much more effective in destroying mastitis organisms, while both are less sensitive to the presence of organic matter and less irritating to the skin. The iodophors, having excellent detergent properties along with their well-known germicidal potency, are particularly well suited to udder washing. That this is widely recognized is shown by the fact that over 44% of the dairymen reported using an iodine product for this purpose in 1963 in the Hoard's Dairyman survey *(3)*.

The sanitizing solution should be made up according to the manufacturer's directions, and applied with either a paper towel or individual sterile cloth. After washing the udder and teats thoroughly, the towel or cloth should be wrung out and the udder and teats dried as well as possible. If udders are very dirty, they should be washed first in warm water before washing with the sanitizer. The solution should be changed when it becomes dirty and its germicidal effectiveness is reduced.

Teatcup Dipping.

Even though the teatcups are sterile, and the udder and teats have been thoroughly washed, as soon as milk from an infected quarter comes in contact with them they are all set to transmit infection. Using laboratory-infected inflations, Newbould and Barnum *(12)* obtained a reduction in numbers of staphylococci of over 90% by a 15-sec treatment in warm (110 F) "Iosan" solution (50 ppm Available Iodine) without pre-rinsing with warm water. Chlorhexidine at 400 ppm, without a pre-rinse, took over 30 seconds for a similar reduction, as did "Diversol" and "Antibac" at 250 ppm and "Pfanstiehl 20", a quaternary ammonium compound, at 300 ppm, even when a pre-rinse was employed with the last three products. On farm trials, however, lower reductions in numbers were observed.

Various other workers have studied experimentally the effectiveness of different sanitizing solutions for dipping teatcups. Most of them have recognized the difficulties in obtaining good results on the average farm, where sufficient contact time is rarely allowed for adequate destruction of mastitis organisms; where milker rubberware is frequently deteriorated, providing safe hiding places for these organisms; and where proper care is not always taken to avoid airlocks with long-tube milkers, or to rinse off residual milk before disinfecting. Consequently, workers at the National Institute for Research in Dairying at Shinfield, England *(5)*, and at the Ontario Veterinary College at Guelph, Canada *(16)* have since about 1960 been advocating "pasteurization" of teatcups as the most certain way of killing mastitis bacteria. While circulation of water at 185 F for 5-8 seconds through the teatcup cluster might not be difficult in a parlor, it would be much more cumbersome in a stanchion barn, although English workers have been doing this successfully for years *(11)*. As Newbould *(10)* put it, "The problem is not, therefore, whether clusters can be sterilized effectively between cows, but rather of waiting for development of practical apparatus by agricultural engineers." Until such apparatus is developed, the correct use of a suitable sanitizing solution, preferably using two pailfuls, will go a long way in reducing the numbers of mastitis organisms on teatcups. Even though more bacteria remain than with "pasteurization", "half a loaf is much better than no bread!"

Teat Dipping.

Since Moak *(4)* in 1916 reported remarkable success in reducing mastitis by teat dipping, many others have advocated this practice. Of the various disinfectants tried, chlorhexidine and iodophor have given the best results. Newbould and Barnum *(14)* reported a significant ($P = <0.01$) reduction in count of staphylococci using Iosan at 100 ppm, while chlorhexidine produced variable, ineffective results even up to 800 ppm. In a later paper *(16)* they used an iodophor with 10,000 ppm iodine, and obtained a much lower mean count with teats dipped and teatcups not pasteurized that where teats were not dipped but teatcups were pasteurized. Chlorhexidine at full strength (1.6%) also gave a good kill, but caused cracking and scaling of the teat skin. When tests were repeated using 0.5% solution the reduction in count was much less pronounced. At the National Institute for Research in Dairying *(6)* a chlorhexidine solution (0.5%) was also found effective in reducing the numbers of *Staphylococcus aureus* on teat skin but caused chapping.

Hickman and Logan *(2)* have reported that neither dipping teats in an iodophor solution, nor massaging all external teat tissue with a disinfectant hand lotion (Dettol) widely used in hospitals, had any detectable value in reducing the infection rate among 12 cows over a three-month period. On the other hand, recent reports from herds enrolled in the Ontario Mastitis Control Program showed a marked improvement where teat dipping with an iodophor or chlorhexidine was a major change in the milking procedure.

During the past few years, two quite extensive field trials have been conducted by workers in England *(6)* to evaluate a "full hygiene" program in which all factors were included. In the first, 14 herds,

comprising over 700 cows, were divided into two groups. In the one on a full hygiene program, milkers wore smooth rubber gloves, udders were washed with 100 ppm solution of chlorhexidine digluconate using individual sterile cloths or paper towels, teatcup inflations were "pasteurized" by circulating 185 F water through to the receiver jar for 5-8 seconds between cows, and teats were dipped in a 5,000 ppm solution of chlorhexidine immediately after milking. For the other group, the control, udders were washed with warm water only, teatcups were not disinfected between cows and teats were not dipped. They reported *(7)* that, "there were uncontrolled factors affecting the new infection rate within the two groups of herds that had a greater influence than the experimental treatment. Nevertheless, the total of new infections in the hygiene herds appears to have been reduced by 50% compared with the control herds, and when cross-infections are eliminated the reduction was 60%."

When this experiment was completed, another was started which was designed to compensate for the uncontrolled factors found in the first field trial *(8)*. Three groups of herds were established, with five in each. Each group was on one of three programs for a six month period, then switched to a second, and six months later to a third. The three treatments were; full hygiene—the same as in the previous trial, except that udders were washed and hands disinfected with an iodophor solution (100 ppm) and teats were dipped after milking in the iodophor solution at 5,000 ppm; partial hygiene—the same as full hygiene except that teatcups were not pasteurized between cows; control—as in the first trial. This second trial was completed in November 1965; preliminary results are shown in Table 2. Here it is evident that although Full Hygiene treatment gave better control of infection than Partial Hygiene, the latter was a vast improvement over the Control treatment.

While no reason was given for the switch from chlorhexidine to an iodophor in the second series of trials, in the first series reference was made to "the high incidence of chapped teats in the hygiene herd which had not been anticipated" *(7)*. Newbould and Barnum *(6)* also have reported that chlorhexidine is irritating to the skin of the teat.

Presumably because the full hygiene procedure may be too involved for the average producer, the English workers are not recommending it, but are trying to improve the partial hygiene procedure. At a recent Mastitis Teach-In *(1)* some 500 producers heard them describe the results of their second field trials. One producer, milking 120 cows, commented

TABLE 2. INFLUENCE OF VARIOUS PROCEDURES ON MASTITIS INFECTIONS[a] (EACH OF 15 HERDS SPENT 6 MONTHS ON EACH PROCEDURE)

Procedure	Total new infections	Staph.	Strep.	Clinical mastitis
Control[b]	757	390	320	409
Full hygiene[c]	298	139	95	217
Partial hygiene[d]	425	187	123	231

[a]Data taken from National Institute for Research in Dairying, Annual Report for 1965.

[b]Control: Cows' udders washed with warm water only: no disinfection of teatcups between cows and no teat disinfection after milking.

[c]Full hygiene: Milker wears smooth rubber gloves for milking and disinfects gloved hands and udders with an iodophor solution (100 ppm available iodine) using paper towels or individual sterile cloths for each cow. Teatcup clusters pasteurized before milking each cow with circulating hot water (185 F for 5-8 seconds). Cows' teats dipped immediately after milking in iodophor (5,000 ppm available iodine).

[d]Partial hygiene: Similar to full hygiene except that teatcups are not disinfected between cows.

that after a few months on the program chapped and sore teats had completely disappeared, while the use of antibiotics had nearly ceased.

It should be emphasized that a sanitation program in itself, no matter how complete it may be, is not the complete answer to the mastitis problem. The roles of good milking equipment and proper milking procedure cannot be ignored. Furthermore, it is not possible to take only a part of the program, such as teat dipping, by itself and expect to control infection. Milkers' hands, udder cloths and teatcups can all convey infection from diseased to healthy cows, hence all must be included in an effective program. Few people milking cows appear to appreciate that *mastitis is an infectious disease*, and that the various steps outlined above are all necessary if the spread of the disease is to be curtailed. Here is where the fieldman and sanitarian can do a lot of good in emphasizing the importance of a *complete* program of sanitation in mastitis control. The English results show how effectively such a program can reduce infection and clinical mastitis on commercial dairy farms. We need more studies of this nature under North American conditions to confirm their findings.

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FDA REGULATIONS COVERING FORTIFIED FOODS

The Food and Drug Administration has designated eight classes of foods to which specified amounts of certain vitamins and minerals may be added to improve nutritive value.

The eight classes increase the number of foods (such as evaporated milk, enriched flour and bread, enriched corn meal, and margarine) already covered by "Definitions and Standards of Identity" that permit adding vitamins and minerals. The eight classes include processed cereals, fruit juices and fruit drinks, infant formulas, infant fruit products, alimentary pastes, whole fluid and powdered milk for drinking, fluid skim milk and fluid low fat milk for drinking, and salt.

The "Definitions and Standards of Identity" for Vitamin and Mineral Fortified Foods state which vitamins and which minerals may be added to each of the eight classes and specify the conditions. They apply only to added vitamins and minerals, however, and not to the natural composition of the foods. For example, cereal grains are known to be good sources of Vitamin B_1, Vitamin B_2, Niacin, and Iron. These four nutrients may be added to enriched flour under another Food Standard. They may be added to processed cereals under the new "Definitions and Standards of Identity" when processing has resulted in more than a 25 percent loss in potency of natural grain for the particular nutrient.

The name of each food to which vitamins and/or minerals have been added shall be immediately accompanied by a statement which spells them out. Processed cereals with all four permitted nutrients added will bear the statement "Fortified with Vitamin B_1, Vitamin B_2, Niacin, and Iron." Any of these fortified foods will be illegal, however, if the labeling or advertising contains any statements or pictures implying:

—that the food is adequate or effective for the treatment or prevention of any disease or condition;

—that a diet of ordinary foods will not supply adequate amounts of vitamins and minerals;

—that significant segments of the United States population are suffering or are in danger of suffering from a deficiency of vitamins or minerals.

In establishing the "Definitions and Standards of Identity" for Vitamin and Mineral Fortified Foods, FDA adopted the Statement of General Policy in regard to the Addition of Specific Nutrients to Foods issued in 1961 by the Food and Nutrition Board, National Research Council, National Academy of Sciences, and the Council on Foods and Nutrition, American Medical Association. This statement urges that nutritional needs be met by using an adequate variety of foods and establishes the ground rules for adding nutrients to foods.

PROFESSIONAL DEVELOPMENT BY HOMESTUDY[1]

H. E. EAGAN

Communicable Disease Center
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Homestudy courses are a means of direct training and an aid to local, state and federal health organizations in constructing in-service training programs.

The Training Branch of the Communicable Disease Center has four major objectives in its program to strengthen the public health endeavors to control the incidence of communicable diseases. These objectives are basic and are planned to: (1) aid the states in the development and improvement of their own training resources; (2) provide training in those states where training services are not otherwise available; (3) promote the use of public health training aids; and (4) provide training services for the Public Health Service and other federal agencies.

At the beginning of the training activities in 1945, all CDC courses were held at the headquarters at Savannah and Atlanta. Field training stations were soon developed in eight locations throughout the United States. This step brought training into every geographical area of the country. When it was discovered that even this arrangement did not meet the need because of state limitations on out-of-state travel, field courses were undertaken. This mobile training could be taken into any state and it reached and continues to reach a significant proportion of the states' public health personnel. But the high cost of field courses severely restricts this activity.

Concurrent with these developments, the Center was encouraging in-service training programs within the individual states by assisting the states to conduct their own training programs. Despite these efforts, however, an appreciable number of state and local personnel were not receiving badly needed instruction.

So, in spite of the expansion and diversification of the Center's training program, the demand for qualified personnel, particularly in the field of environmental sanitation, could not be satisfied by the means at hand. Population growth and the public's demand for more and better services combined to aggravate the situation, while the demand grew to far exceed the services. The situation was about the same with respect to other public health disciplines. The obstacles to training, though circumvented to some degree by field stations, field courses, in-service training and other measures, have not been removed in fact or reduced in quantity.

A given facility still can accommodate only so many persons, fiscal regulations that prohibit employees leaving a state for training have not been changed, and personnel shortages continue to make it impracticable to release employees from their work for full-time training. To surmount these obstacles requires a system that will (a) allow trainees to remain at their duty stations and carry their usual workloads and (b) require a minimum outlay of funds, in contradistinction to the substantial cost of per diem and travel that is required to attend formal courses at locations remote from the work station.

Homestudy courses offer a basis for a training program that will meet these requirements. They have a further desirable characteristic of allowing each trainee to set his own goal. The theoretical advantages of homestudy courses were sufficiently enticing that in 1962 the State of Mississippi undertook an experiment with homestudy courses for county sanitarians. With the advice and counsel of Mr. C. Bradley Bridges, then Regional Training Consultant of DHEW, Region IV, the first course, "Basic Mathematics for the Sanitarian," was launched on a statewide basis. The initial field trial showed this sort of activity to be both popular and beneficial. "Basic Math" was quickly followed by "Communicable Disease Control," "Vector Control," and other homestudy courses.

The success of the Mississippi experiment led Mr. Bridges to modify three of the Mississippi courses to meet the requirements of all states and to offer these courses on a nationwide basis. The first offering was made July 1, 1965. More than 1450 individuals in 43 states and two foreign countries have since enrolled. A breakdown of the origins of this response indicates that the homestudy courses are meeting a significant need among sanitarians and members of other public health disciplines, not only throughout the United States but in Canada and a number of foreign countries as well. Several local health units now require completion of certain courses as part of their in-service training.

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[1]Presented at the annual meeting of the Michigan Public Health Association, Environmental Health Section, Detroit, Michigan, May 12, 1966.

ADMINISTRATION

The Center's homestudy courses are administered by the Special Projects Unit of Training Branch's Community Services Training Section. Lessons are developed, field tested, and processed by the unit's staff. The courses are made available to individuals as well as groups.

Circumstances alter administrative requirements; no one procedure has proved practicable for all the needs of all the states. Present administrative philosophy is to reserve sufficient flexibility to meet the needs of the majority of interested agencies.

Under the group enrollment plan, there is no contact between trainee and Center personnel; all arrangements are made with the agency or institution that sponsors the course for its employees. Homestudy material is sent to the sponsoring agency which, in turn, arranges for its distribution to the trainees. Completed lessons are collected and returned by the sponsor. They are then graded and returned to the sponsor by Center personnel. Under this plan, which requires each trainee's supervisor to handle final administrative details, dropouts are extremely rare.

The individual enrollment plan permits applications to be forwarded by individuals with the endorsement of the sponsoring agency to the Communicable Disease Center. All communication between the Center personnel and the trainee is direct in this arrangement.

OPERATING PROCEDURES

Prospective trainees must fill out and sign a "training application." This application must, except under certain conditions, be approved by the applicant's sponsoring agency. When applications are received at CDC, the first lesson of the requested course (in quantity appropriate for individual or group) is mailed. As completed lessons flow into the Center, papers are corrected and records showing approval, disapproval, grades, etc., are kept for each trainee. Answer sheets are returned to trainees with the mailing of each successive lesson.

Final examinations are taken under the supervision of a preselected proctor and without access to any reference material. All other lessons and review examinations are "open book" studies. Satisfactory completion of a course is determined by the trainee's score on the final examination. The answer sheet is returned to the trainee but not the examination. When performance is satisfactory, a certificate of completion is issued and the announcement of his grade is mailed.

COURSES AVAILABLE

Basic courses are now offered in three separate subject areas of environmental health. These courses fulfill two needs. For the newly employed trainee they supply essential basic information and for the more experienced employee they provide review of topics pertinent to everyday work. The first of these courses, "Basic Mathematics for the Sanitarian," is made up of eleven lessons, two review examinations, and the final examination. The content of these lessons was selected to develop and refresh the competency of the trainee in several areas: making conversions from one measurement system to another, determining chemical dosages, and calculating areas and volumes of certain regular figures and forms. Among the subjects presented are whole numbers, fractions, decimals, powers and roots of numbers, and the geometry of areas and volumes of polygons and solids.

"Communicable Disease Control for the Sanitarian" is designed to develop the trainee's concept of modern control methods applicable to those communicable diseases that can be affected through alteration of the environment. Subject areas include diseases of animal origin, morphology and reproduction of microbes, quantitative and qualitative considerations regarding bacteria, and diseases transmitted by milk, food, water, and the arthropods.

Of the three basic references used in this course, one is a standard textbook which must be procured either by the participant or his agency. All other references are furnished. Each lesson is made up of reading assignments and an open book examination. These examinations must be satisfactorily completed before the next lesson is released to the trainee.

"Insect and Rodent Vector Control for the Sanitarian" is largely descriptive; there are no projects or laboratory exercises. The descriptive taxonomy included in this course is covered by physical character keys and other aids. The variety of these aids enables the participant to concentrate on any particular area that interests him. A broad section of the field of vector control is covered by the various subjects offered in this course. Among these subjects are: arthropods of public health importance; insecticides and insecticidal equipment; sanitation in vector control; the control of domestic rats and mice; biological factors in domestic rodent control; household and stored food insects; and the biology and control of flies, mosquitoes, fleas, lice, ticks, and mites.

Each of the eleven lessons of the course ends with an open book examination which must be satis-

factorily completed before the next lesson is released to the trainee.

ADDITIONAL COURSES PLANNED

Additional courses, both general and specific in coverage, are planned to span the entire field of environmental sanitation. The first of these, to be entitled "Environmental Sanitation," will be made up of 17 lessons and a final examination. It will use a nationally recognized textbook on sanitation as its main reference. Aimed at the sanitarian who has had neither extensive training nor field experience, it is to be a basic or prerequisite course to be mastered as background for more advanced or specialized instruction.

SUMMARY

If personnel of state and local health organizations are to realize their full potential in the control of communicable diseases, they must have training in the basic subjects dealing with the sanitation of the environment. The CDC homestudy courses have been developed to meet this need.

Homestudy courses combine the convenience of study at home—and at leisure—with the benefit of guidance from an experienced and competent staff. Under the circumstances made possible by homestudy courses, individuals can, without absenting themselves from work and without unusual cost to their organization or themselves, broaden their knowledge of the environment and the environmentally related techniques that are involved in the control of communicable diseases.

The acceptance of this method of training by people in several different public health disciplines has been most gratifying. During the last year, the limited staff engaged in handling these courses has been severely taxed to handle the 1450 trainees who have taken this training.

Homestudy courses are intended to be supplementary to existing programs; they are not expected to replace conventional training. New homestudy courses are being develop and old ones updated. It is hoped that in a few years an array of courses broad enough to cover every phase of sanitation can be made available.

FOOD AND DRUG LAW INSTITUTE BROCHURE AVAILABLE

The Food and Drug Law Institute Inc. has issued a brochure describing the basic purpose of the Institute which is "to advance the public welfare by furthering knowledge about food, drug and related laws and their effective application."

The bulletin discusses briefly the educational programs undertaken by the Institute including: support of instruction in these laws at leading law schools; conferences, lectures and seminars bringing together representatives of industry, government, consumers and professionally interested parties; publications of the Food Drug Cosmetic Law Journal which provides timely articles and research studies on current legal problems; and maintenance of a comprehensive working reference library on food, drug and related laws. FDLI also engages in international activities.

The administrative and organizational structure of the Institute is outlined and the brochure lists supporting industry members and public members and identifies the current officers and trustees. Membership information is supplied.

The Food and Drug Law Institute, Inc. has its offices at 205 East 42nd Street, New York, N. Y. 10017 and its president and management officer is Franklin M. Depew.

PHS ANNOUNCES CONFERENCE ON AIR POLLUTION

A National Conference on Air Pollution sponsored by the Public Health Service will be held in Washington, D. C. on December 12-14, 1966. The Conference will be open to the public and participants will be physicians, engineers, scientists, legislators, control officials and representatives of business, labor, and civic organizations.

In announcing the Conference John W. Gardner, HEW Secretary, stated that "in spite of improved local, state and federal control programs, air pollution is still growing faster than our combined efforts to cope with it. The purpose of the Conference will be to examine our present abatement efforts and to explore new approaches to this urgent task."

Conference planning will be conducted by the PHS Division of Air Pollution. Vernon G. MacKenzie, Chief of the Division, has appointed Assistant Division Chief Arthur C. Stern as Executive Secretary for the 1966 Conference. The last National Conference in 1962 was attended by some 1500 persons and a larger participation is anticipated this year.

Additional information on the Conference and program is available from the Executive Secretary.

CHARACTERIZATION OF BACTERIA WHICH PRODUCE COLONIES ATYPICAL OF THE COLIFORM GROUP ON VIOLET RED BILE AGAR[1]

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Summary

Thirty-three strains of bacteria were isolated during routine analysis of dairy products at two Canadian centers from colonies on violet red bile agar VRB which measured less than 0.5 mm in diameter after incubation at 35 C for 24 hr. All isolates showed typical coli-form morphology and Gram reaction and from the results of biochemical test were identified as coliform biotypes. No strain survived laboratory pasteurization at 145 F for 30 min. Strains of presumptive intestinal orgin (*E. coli*) were typed serologically and one strain was found to be of serotype 026:B6, an important etiological agent of infantile diarrhoea. It is concluded that size of colony is not a valid criterion for discriminating between colonies of coliform and non-coliform bacteria on VRB.

Coliform organisms have probably received more attention than most other groups of bacteria occurring in dairy products, apart from the lactic acid bacteria, owing to their importance as "indicator" species in routine analysis. The presence of even a few coliforms per unit volume in a product immediately after adequate pasteurization suggests recontamination from improperly sanitized equipment or unsanitary handling, while a higher coliform density in a stored product may indicate a higher initial recontamination or inadequate refrigeration. To enable a reliable assessment of the sanitary quality of a product to be made therefore, accurate determination of its coliform density is essential. When such a determination is made by a plating method using a solid medium, clearly a major factor governing its accuracy is the precision of the colony count.

The American Public Health Association (APHA) has formulated and published *(1)* a detailed plating procedure for coliform tests of dairy products using the solid medium violet red bile agar (VRB). On this medium subsurface colonies of coliform bacteria, which by definition ferment lactose *(1)*, are purplish red in color and are usually surrounded by a reddish zone of precipitated bile *(3)*. According to the APHA recommendations *(1)*, only colonies which show these characteristics and which, in addition, measure 0.5 mm or more in diameter on uncrowded plates incubated at 32 or 35 C for 18-24 hr should be counted. Colonies with a diameter of less than 0.5 mm on such plates are not considered to be of coliform bacteria.

In the course of a survey of coliform biotypes in Canadian pasteurized dairy products (to be reported elsewhere) a number of strains isolated from colonies on VRB which were atypical of coliform colonies on the basis of their diameter (i.e. < 0.5 mm) were studied to determine whether failure to enumerate them in routine analysis was justified. The results obtained form the substance of this report.

Materials and Methods

Isolates

Thirty-three strains of bacteria were isolated from colonies on VRB which measured less than 0.5 mm in diameter after incubation for 24 hr at 35 C. The isolations were made at two geographically separated Canadian centers during routine analysis of various pasteurized dairy products and were shipped to this laboratory, without prior incubation, in 5-ml screw-capped tubes containing VRB. Preliminary examination of the tubes on receipt showed that sufficient growth for subculturing the isolates had developed during transit. Each isolate was then streaked on a VRB plate and the inoculated medium was overlaid with 4-5 ml of sterile VRB. Plates were incubated at 37 C for 24 hr and a single discrete colony was picked into nutrient broth (NB). After incubation a smear was prepared from each broth culture and stained by Gram's method. The smears were examined for the Gram-negative short rod character typical of coliform bacteria. In this way an apparently pure culture of each isolate was obtained. To test the stability of its colony characteristics on VRB each purified isolate was serially transferred several times in pour plates of this medium; inoculated plates were incubated at 37 C for 24 hr between transfers.

Biochemical tests

A series of biochemical tests was carried out on each isolate using methods recommended in Manual of Microbiological Methods *(8)*. Each strain was treated in duplicate and control tests on uninoculated media were run in parallel with each set of tests performed. The tests used were those for *(a)* gas production in brillian green bile 2% (BGB) within 48 hr at 37 C; *(b)* growth in BGB at 44-45 C (modified Eijkman test); *(c)* indole production; *(d)* reduction of pH to 4.5 or lower in dextrose broth incubated for 48 hr at 37 C (methyl red test); *(e)* acetoin production (Voges-Proskauer test); *(f)* citrate utilization; *(g)* gelatin hydrolysis.

Classification

From results of these tests each isolate was classified according to a scheme which combined the systems proposed by Wilson *(10)* (Group I) and Mushin and Ashburner *(6)*

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TABLE 1. BIOCHEMICAL CLASSIFICATION OF 33 BACTERIAL STRAINS PRODUCING COLONIES ON VIOLET RED BILE AGAR ATYPICAL OF COLIFORM BACTERIA

Biochemical characters								
Gas from BGB at 37C	Growth at 44-45C	Indole produced	Dextrose broth pH 4.5	Acetoin produced	Citrate utilized	Gelatin hydrolyzed	Biotype	No. of strains found
							Group I:	
+	+	+	+	−	−	−	*E. coli* I	2
+	−	−	+	−	−	−	*E. coli* II	1
+	−	−	+	−	+	−	Intermediate I	4
+	−	−	−	+	+	−	*A. aerogenes* I	5
+	−	+	−	+	+	−	*A. aerogenes* II	4
+	−	+	+	−	−	−	Irregular I	1
+	−	−	−	+	−	−	Irregular V	4
+	+	−	−	+	+	−	Irregular VI	3
							Group II:	
+	−	+	+	+	+	−	Irregular B	2
+	−	−	+	+	+	−	Irregular E	1
+	−	+	−	+	−	−	Irregular F	1
+	−	+	−	−	−	−	Irregular G	1
							Group III:	
+	−	−	+	+	−	−	Irregular M	3
+	−	+	−	−	−	+	Irregular S	1
							Total	33

(Group II) with a system (Group III) set up during the present investigation to accommodate biotypes which could not be assigned to either of the former groups.

Laboratory pasteurization

The effect of laboratory pasteurization on the survival of the isolates was tested as follows: A 1-ml volume of sterilized skim milk, inoculated from a 24-hr NB culture to contain 50,000 - 700,000 cells per ml, as determined by a standard plate count (SPC) *(1)*, was sealed into a sterile 6 x 100 mm glass tube in such a way that heating of the milk was avoided. After cooling, the tubes were completely immersed in a water bath at 145 F. Since preliminary experiments using thermocouples sealed into similar tubes of skim milk had established an average warm-up time of 75 sec, the inoculated tubes were removed from the bath after 31 min and 15 sec, and immediately cooled in ice-water. In this way the cells were exposed to the temperature of the bath for exactly 30 min. Cooled tubes were incubated at 37 C for 24 hr; they were then opened aseptically without heating the milk and the contents were plated with VRB. Absence of colonies from the plates after incubation at 37 C for 48 hr indicated inability of the organism to survive laboratory pasteurization.

Serological typing

Strains classified as *Escherichia coli* I, *E. coli* II or Irregular I biotypes were tested against antisera to a number of well-established enteropathogenic *E. coli* serotypes *(9)*, using a modification of the procedure recommended in Difco Supplementary Literature *(4)*. Each test organism was grown at 37 C for 18 hr in brain heart infusion (BHI) and the culture was heated in a boiling water bath for 1 hr. The cell suspension was then standardized optically at 600 mμ against a cell suspension in BHI previously shown by a SPC to contain 5 x 10^8 cells per ml. The appropriate monovalent antiserum (Difco) was serially diluted in Kahn serological tubes with 0.85% sodium chloride solution. From an initial tenfold dilution of antiserum serial two-fold dilutions were prepared to a maximum of 1:2560 *(8)*. An additional tube containing only 0.5 ml of NaCl solution was included as a control. One-half milliliter of test cell suspension was then added to each tube and mixed with the diluted antiserum. The tubes were incubated in a water bath at 50 C for 18-20 hr and examined for agglutination every 2-4 hr. Agglutination at an antiserum dilution of 1:320 or greater showed the test organism to contain the homologous O antigen. This constituted identification of the serotype.

RESULTS

All 33 isolates studied showed typical coliform morphology, cell arrangement and Gram reaction when examined microscopically. Their colonies on VRB were typically red but in some cases lacked a halo of precipitated bile. On serial transfer in uncrowded VRB pour plates the small colony size characteristic of the isolates on initial isolation was generally maintained, although a few isolates showed occasional colonies with diameters in excess of 0.5 mm. These were sufficiently infrequent to suggest that colony diameters of less than 0.5 mm were typical of the strains.

Results of the biochemical tests are shown in Table 1. Responses of the various isolates to these tests were variable, yet the characters of 29 of the 33 strains studied fitted those of previously recognized coliform biotypes. Of these, 12% fell in the group of presumptive intestinal origin represented by *E. coli* I, *E. coli* II and Irregular I biotypes. The

4 biotypes classified in Group III have not previously been recorded. All isolates produced gas in BGB within 48 hr at 37 C.

Three of the 4 presumptive intestinal biotypes tested serologically failed to agglutinate with any of the antisera used; one, however, was identified as belonging to serotype 026:B6. This strain was an *E. coli* II biotype which had been isolated from homogenized milk showing 300 coliform colonies per ml on VRB. Under the test conditions it agglutinated at the highest dilution of homologous antiserum used, namely 1:2560.

None of the 33 isolates studied survived laboratory pasteurization at 145 F for 30 min.

DISCUSSION

Violet red bile agar is not absolutely selective for the growth of coliform bacteria. According to Standard Methods *(1)* some strains of cocci may produce minute red colonies and Koburger *(5)* has reported that *Mimi polymorpha,* a Gram-negative cocco-bacillus, produces red spindle-shaped colonies less than 0.3 mm long on the medium. Barber and Fram *(2)*, in an investigation of false coliform counts on fruit ice cream, showed that sucrose carried over with the sample permitted development of colonies of non-coliform bacteria on several selective media, including VRB. If organisms other than coliforms produce colonies on VRB under conditions used for the coliform count, the question arises as to the basis on which such colonies may be omitted from consideration when colony counts are made, in order that errors in the coliform count may be minimized. In Standard Methods it is recommended that the distinction between colonies of coliform and non-coliform bacteria be made principally on the basis of colony size, the critical diameter being 0.5 mm. This recommendation is apparently made on the basis of the finding of Yale *(11)* that red colonies less than 0.5 mm in diameter rarely formed gas from lactose and therefore did not represent true coliforms.

In the present investigation 33 strains of bacteria present in dairy products were isolated from colonies on VRB with diameters less than 0.5 mm; these colonies would have been considered atypical of coliform colonies, and hence disregarded, in coliform counts in which Standard Methods recommendations were followed. That these isolates were indeed coliform bacteria is shown by the typical microscopic appearance and Gram reaction of their cells, by their ability to ferment lactose in BGB with production of gas and by their response to a number of biochemical tests. In no case did the biochemical characters of an isolate agree with those of *M. polymorpha (7)*. With the exception of 4 strains all were identified as recognized coliform biotypes, although the remaining 4 were also coliform strains. Support for the identification of at least one of the strains studied as a coliform is its recognition as an enteropathogenic *E. coli* serotype. Serotype 026:B6 is accepted as one of the more important etiological agents of infantile diarrhoea *(9)*.

The results of this study suggest that colony size is not a valid criterion for excluding certain colonies from enumeration in coliform counts using VRB. Failure to enumerate red colonies with diameters less than 0.5 mm, whether or not these colonies show a halo of precipitated bile, may lead to underestimation of coliform populations in dairy products and hence to erroneous assessments of their sanitary quality. Special significance in this respect attaches to the finding of an enteropathogenic *E. coli* serotype which produced an "atypical" colony on VRB.

It is suggested that further study of types of bacteria producing colonies on VRB should be undertaken, with a view to improving the selective properties of the medium or otherwise to facilitate discrimination between colonies of coliform and non-coliform bacteria.

ACKNOWLEDGMENTS

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THE FREEZING POINT OF MILK PRODUCED IN FOUR MARKETS IN TENNESSEE

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SUMMARY

Seasonal differences occur in the freezing point depression (Δ) of milk produced in Tennessee. A larger Δ occurred in the colder months of the year than in the summer and early fall of 1963 and 1964. Weather conditions were of more significance in the fall and spring than in winter and summer. High temperatures and high vapor pressures were associated with smaller Δ 's. The Δ between herds was statistically different, but this difference could not be attributed to the breed of cow in the herd. Producers whose milk had a small average Δ had, in many cases, a great deal of variation in their Δ 's. The relationship between quantity of milk sold per producer and Δ is, at most, very slight.

Several factors are thought to be of importance in regard to variations in the freezing point depression (Δ) of milk. Buchanan and Lowman *(1, 2)* found the Δ of milk to be different in different seasons, though they thought that pasture conditions contributed to a large degree to these variations. Tucker *(14)* found a tendency toward smaller Δ during the colder months of the year. However, Freeman *(4)* found milk to have a smaller Δ in April and November than in February and August. Clark *(3)* observed a change toward a small Δ on the first few warm days of spring. Rees *(9)* working in Tasmania, found a downward trend in Δ as the season moved from spring to fall, an effect which he thought was due to poor pasture conditions.

Shipe *(12)*, in his review in 1959, noted seven papers on differences between breeds and concluded that the amount of data was insufficient to make definite conclusions. Different breeds seem to respond differently to changes in feeding practices *(13)* or possibly season *(4)*.

Robertson *(11)* found no distinctive or consistent trend between herd size and Δ of the milk. Shipe, et al. *(13)* found that cows on pasture produced milk of a greater Δ than those on a hay-grain mixture and more variation in Δ occurred in the milk from the cows on pasture. The authors suggested that some of this variation may have been due to pasture conditions as well as temperature and humidity conditions. Pinkerton and Peters *(8)* found the Δ of milk could be altered by changing the feed.

Regan and Richardson *(10)* housed cows for several days at 40, 70 or 95 F at 60 per cent relative humidity and found the Δ of the milks to be 0.536, 0.538, and 0.525, respectively. When the cows were housed above 80 F the percentage of SNF and protein in the milk decreased. The authors suggested the change in Δ might be due to a decreased secretion of milk sugar by those animals housed at high temperatures. Kamal, et al. *(6)* found a lower concentration of blood glucose in cows housed at 95 F than in those housed at cooler temperatures (down to 35 F).

Gaalaas *(5)* found increases in the body temperature and respiration rate when Jersey cows were exposed to high atmospheric temperatures. He noted that these increases were not the result of high relative humidity. However, the vapor pressure of air was higher at times of high body temperature and respiration rate. Lee *(7)* explained the importance of vapor pressure of air to animal comfort. At constant temperature, water evaporates more readily at low than at high vapor pressures. As the vapor pressure increases, evaporation is reduced. Vapor pressures of air in Tennessee range from about 3 to 25 mm Hg; however, the high readings occur in the summer when evaporation of water from the cow for cooling purposes is needed most.

The strict enforcement of Δ standards on milk shipped interstate causes the handlers, and in turn the milk producers, to seek means of avoiding small Δ values. Grade A milk failing to meet the minimum standards has been diverted to manufacturing plants and at times of abnormally small Δ's milk producers have been advised to refrain from rinsing teat cups between the milking of different cows. The serious nature of the problem and the apparent innocence of some of the producers prompted efforts to discover the relationships of various weather conditions and production factors to the production of milk of abnormal Δ.

PROCEDURE

In cooperation with the Mid-South Milk Producers' Association, questionnaires in regard to various production practices were obtained in October, 1964, from 183 producers in 11 counties in the Memphis Milk Shed. Thirty-one of these producers were selected for further study over an 11-month period beginning in October, 1964.

TABLE 1. CORRELATION COEFFICIENTS BETWEEN WEATHER VARIABLES AND FREEZING POINT DEPRESSION OF MILK

	Knoxville	Memphis				
	63-64	Oct. Survey	Fall 1964	Winter 64-65	Spring 1965	Summer 1965
No. of Observations	2067	183	149	136	555	309
Variate						
Maximum Daily Temperature						
Sampling date	−0.17		−0.35	−0.06	−0.24	−0.05
1 day prior	−0.17		−0.34	−0.10	−0.28	−0.03
2 days prior	−0.16		−0.35	−0.07	−0.23	+0.04
Vapor Pressure						
Sampling date	−0.12	−0.01	−0.29	−0.06	−0.26	−0.07
1 day prior	−0.13	+0.11	−0.24	−0.03	−0.25	−0.04
2 days prior	−0.13	+0.01	−0.21	−0.04	−0.17	−0.09
Relative Humidity						
Sampling date	+0.005	−0.10	−0.21	−0.06	−0.09	−0.05
1 day prior	+0.011	+0.08	−0.12	+0.03	−0.01	+0.02
2 days prior	+0.004	−0.06	+0.05	+0.01	+0.07	+0.01

Data from the offices of the Southeast Milk Sales Association, Bristol; the Chattanooga Area Milk Producers' Association; and the Knoxville Milk Producers' Association were analyzed statistically to determine if breed, season or quantity of milk sold per producer had a significant relationship to the Δ of the milk. A total of 4045 Δ values on milk from 234 different producers was analyzed.

RESULTS AND DISCUSSION

The average Δ of the milk from 183 producers in the questionnaire was 0.533 ± 0.004. Eighteen production variables shown by the t test not to be associated to a significant degree ($P > .05$) with the Δ of milk were: (*a*) county where the farm was located, (*b*) type of shelter, (*c*) frequency of milk pick-up, (*d*) type of barn, (*e*) type of tank, (*f*) milking arrangement, (*g*) concentrate supply compared to 1 yr earlier, (*h*) hay supply compared to 1 yr earlier, (*i*) access to water (daytime only, morning and evening, 24 hr), (*j*) source of water, (*k*) type of salt mixture, (*l*) type of concentrate, (*m*) kind of hay, (*n*) type of silage, (*o*) pasture *vs* no pasture, (*p*) type of permanent pasture, and (*q*) type of temporary pasture. Other production factors and weather variables showing a correlation coefficient of less than 0.1 with Δ were considered to be of minor significance in that these factors accounted for less than 1 per cent of the total variance. These included: ratio of concentrate fed, lb of concentrate fed per cow per day, per cent of protein fed, lb of hay fed per milking cow per day, lb of silage fed per milking cow per day, lb of milk in one day's shipment, and number of cows milked. The sampling date was the day the milk was picked up at the farm. The number of dry cows in the herd and the Δ of the milk from that herd had a correlation of −0.12.

This relationship, as well as the relationship of Δ and vapor pressure one day prior to sampling (0.11), and the correlation of −0.10 between Δ and relative humidity on the sampling date are small, each accounting for only about 1 per cent of the variation in Δ in the October survey from Memphis.

The influence of weather conditions upon the Δ of milk from the 31 producers in the Memphis study was statistically analyzed after the Δ 's were grouped by seasons. In general, the weather conditions as measured in the winter and summer had very little bearing upon the Δ. In the fall and spring, however, these weather conditions had higher correlations with the Δ of the milk (Table 1). A negative correlation coefficient signifies that the Δ moved in the opposite direction from the variable. For example, a correlation coefficient of −0.35 between the high atmospheric temperature on the sampling date and the Δ indicated that on those days when the weather was warm the Δ was less, ie, the milk froze at a warmer temperature. The data show that vapor pressure and atmospheric temperature in the fall or spring each account for about 10 per cent of the variation in the Δ. Relative humidity on the sampling date was of some importance, accounting for about 4 per cent of the variation in the fall. Condensation of water from a moist atmosphere on the walls of a cold bulk tank or lack of evaporation of water from this surface might account for this happening, but one would wonder why this did not occur in the summer also.

Correlations between Δ and weather conditions in the Knoxville area for 1963 and 1964 were calcu-

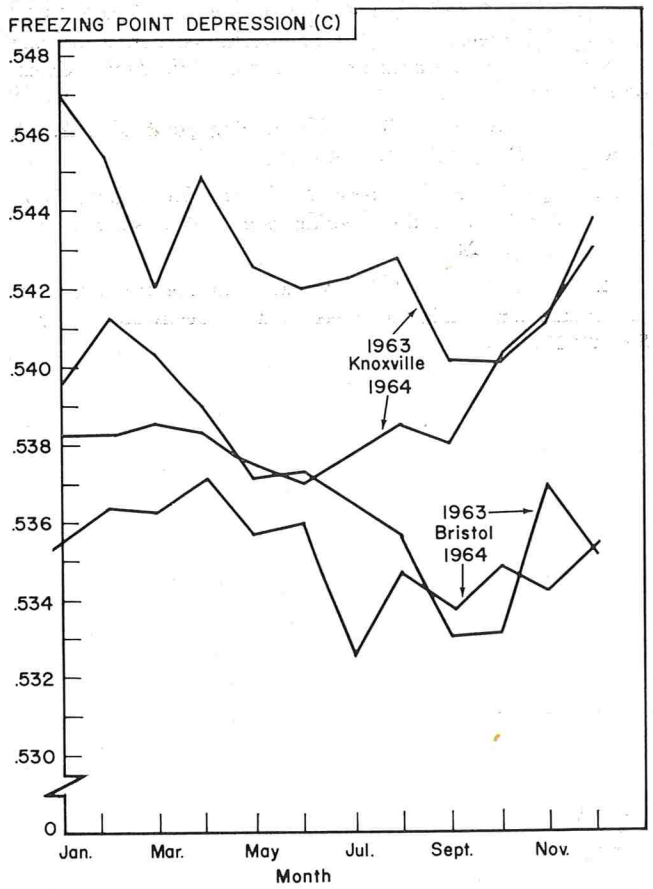

Figure 1. Freezing point depression of milk from selected producers in the Knoxville and Bristol, Tennessee, markets.

lated in the same manner as were those from the Memphis market. The results were very comparable to those at Memphis for the 11-month period. Atmospheric temperature and vapor pressure were more important than relative humidity as related to the Δ of milk. The correlations of minimum daily temperature with Δ were almost identical with those of maximum daily temperatures. The vapor pressure is higher in the summer than in the winter, which might help to explain some of the seasonal variations which have been noted *(13)*.

The 31 producers from the Memphis area were selected because they were in a geographical area of that market in which some producers were experiencing difficulty meeting the Δ standards. The average Δ for this group for the 11-month period, October 1964 to August 1965 was 0.533. There were 38 different producers represented from the Chattanooga area for the months September 1963 to July 1964. The average Δ of this group for this time period was 0.531.

The average Δ 's in the Knoxville and Bristol areas were 0.541 and 0.536, respectively. These data are presented in Figure 1 for the two year period and represent milk from producers selected at random with no consideration given to past Δ history. The average Δ for the years 1963 was found to be different ($P < .05$) than the Δ for 1964. Likewise the Δ 's for between months were different ($P < .01$). A gradual downward trend in Δ is noted from January to September, then a sharp rise to December. Several factors, such as feed changes, stage of lactation and weather conditions may be contributing to this effect.

Other Factors.

The quantity of milk sold had but little bearing upon the Δ, and no breed differences were noted. The average Δ of 353 samples from Jersey herds in the Knoxville market in 1963 was 0.543; the same average was obtained on 661 samples from Holstein herds. Comparable data for 1964 was 0.539 for Jersey milk and 0.538 for Holstein milk. Differences ($P < .01$) between producers were found in those two markets where the data were extensive enough to permit analysis. Those producers who had large standard deviations in their monthly Δ 's tended to have a small Δ, indicating variations in the handling of the milk or animals.

The Δ 's from each of the four market areas were determined in different laboratories by different operators using different cryoscopes. These facts should be borne in mind when comparing the Δ of milk from different geographical areas, as illustrated by Shipe *(12)*.

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BETTER MEAT PLANT SANITATION URGED IN SALMONELLOSIS CONTROL

Salmonellosis, a foodborne disease caused by salmonella bacteria, is transmitted to humans most frequently in poultry, eggs, and red meats, but its spread can be significantly reduced by better sanitation practices in U. S. meat plants.

These are the conclusions drawn by Robert Angelotti and Keith H. Lewis, food research unit scientists at the U. S. Public Health Service's Taft Sanitary Engineering Center in Cincinnati. Their views are expressed in a paper, "Salmonellosis and the Meat Industry," being published by the American Meat Science Association as part of the "Proceedings of the Annual Industry Research Conference." "The U. S. meat industry should accept a leading role in the reduction of food-borne salmonellosis," Drs. Angelotti and Lewis declare, adding that unless it takes such steps, and unless its responsibility to itself and the consumer is discharged, better control of the disease by health agencies will not be possible.

Salmonellosis in humans is reported with some regularity by every State, with estimated attack rates of 5 to 13 per 100,000 population for most of the United States. The national reported rate for 1964 was 13.2% over 1963. Drs. Angelotti and Lewis report that the incidence of foodborne salmonellosis in the United States is steadily increasing. The disease most frequently manifests itself as a violent gastrointestinal upset which is rarely fatal, except in infants and the elderly.

Improved industry practices should emphasize (1) separation of sick from healthy animals enroute to slaughterhouse; (2) rapid transit of healthy animals under sanitary conditions from farm to slaughterhouse; and (3) rapid processing of the animals in the plants and better sanitary controls in carcass handling after slaughter.

Still another major source of infection which should be corrected, they reported, is salmonellae-contaminated feeds which are routinely fed to livestock.

The authors point out that the incidence of animal infection with salmonella increases as the animals are moved through meat processing plants where the lack of proper sanitation contributes to widespread contamination. Better control of the disease may be effected by improved sanitation on the farm and during transportation, holding and processing. Since salmonellae-contaminated animal feeds perpetuate the cyclic route of infection, improved plant design and operations can help to produce salmonellae-free feeds and thus decrease the infection among animals.

Dr. Lewis is Assistant Chief for Research and Training of the PHS Division of Environmental Engineering and Food Protection. Dr. Angelotti is Deputy Chief of the Division's Milk and Food Research unit at the Cincinnati research center.

ASSOCIATION AFFAIRS

RESOLUTIONS ADOPTED AT IAMFES 1966 ANNUAL MEETING

The following resolutions were unanimously adopted by the membership at the 53rd Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, Inc. in Minneapolis, Minnesota, on August 17, 1966.

RESOLUTION NO. 1

WHEREAS: The Secretary of the U. S. Department of Health, Education and Welfare has been authorized to reorganize the and food ordinances and program; and

WHEREAS: Public health food hazard control problems are becoming increasingly complex; and

WHEREAS: The Milk and food sanitation activities of the Public Health Service have long functioned to support state and local programs in these areas, as evidenced by widespread adoption and use of Public Health Service recommended milk and food ordinances and program guides; and

WHEREAS: This Association is deeply concerned with the public health problems associated with protecting the Nation's milk and food supply.

THEREFORE BE IT RESOLVED: That the Secretary of the Department of Health, Education and Welfare, the Surgeon General of the Public Health Service and the Chief of the Bureau of State Services of the Public Health Service be urged to recognize, in the reorganization of the Public Health Service, the need to strengthen existing Public Health Service food hazards control activities and to expand Service activities to other food protection problem areas of public health significance, including increased assistance to state and local agencies in meeting their responsibilities;

RESOLUTION NO. 2

WHEREAS: The 53rd Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians was held in Minneapolis, Minnesota, August 15 to 18, 1966, in the Radisson Hotel, at the invitation of the Minnesota Affiliate; and

WHEREAS: The Local Arrangements Committee of that Affiliate provided excellent facilities and services in the conduct of the meeting;

THEREFORE BE IT RESOLVED: That the Association extend its sincere appreciation to the Minnesota Affiliate of the International Association of Milk, Food and Environmental Sanitarians, and that the Secretary be instructed to transmit this resolution to the President of the Minnesota Affiliate.

RESOLUTION NO. 3

WHEREAS: It is called to the attention of the members of the International Association of Milk, Food and Environmental Sanitarians, assembled in Minneapolis, Minnesota, for their annual conference, that the Samuel J. Crumbine Award has been given to the Jefferson County Department of Health, Birmingham, Alabama, for outstanding achievement in the development of a comprehensive environmental health program; and

WHEREAS: The Award named in honor of one of America's outstanding pioneers in public health, has been presented annually for 12 years and was won in competition with invitations to compete sent to more than 1,200 local health agencies representing every section of the United States; and

WHEREAS: Through early recognition of the community health problems of a highly urbanized area, Jefferson County Department of Health has developed and conducted an outstanding housing program, an accident prevention program and many preventative measures for the prevention of the citizenry from potential hazards stemming from radiological sources; and

WHEREAS: These new environmental health programs have been inaugurated without any minimizing of the traditional programs of milk and food protection; and

WHEREAS: The foregoing accomplishments have been achieved under the able leadership of J. Carroll Chambers, M. D., M.P.H., Health Officer; Mr. Guy M. Tate, Jr., Director, Bureau of Sanitation, and Mr. Paul Pate, Assistant Director, Bureau of Sanitation; aided by the professional sanitarians comprising their staff; now therefore be it

RESOLVED by the International Association of Milk, Food and Environmental Sanitarians that the members congratulate Jefferson County Deparment of Health, Birmingham, Alabama, for its excellent contribution, for its development of an outstanding environmental health program in Jefferson County.

RESOLUTION NO. 4

WHEREAS: It is called to the attention of the members of the International Association of Milk, Food and Environmental Sanitarians, assembled in Minneapolis, Minnesota, for their annual conference, that the Samuel J. Crumbine Award has been given to the Imperial County Health Department, El Centro, California, for outstanding achievement in the development of a comprehensive program of food and drink sanitation; and

WHEREAS: The Award, named in honor of one of America's outstanding pioneers in public health, has been presented annually for 12 years and has been won in competition with invitations to compete to more than 1,200 local health agencies representing every section of the United States; and

WHEREAS: With the use of inventive methods, the health department has attained excellent results in its programs especially for training sanitarians, reviewing individual problems in food establishments, and developing methods to cope with chronically occurring food service difficulties; and

WHEREAS: The Imperial County Health Department has solicited and received excellent cooperation from the food service industry of Imperial County in attaining this Award; and

WHEREAS: Imperial County has received the highest survey rating yet given to a local health department by the California State Health Department; and

WHEREAS: This excellent record has been attained under

the able leadership of Dr. Stanley J. Leland, County Health Officer; Leland E. Carson, Director of Sanitation; and through the efforts of Sanitarians, Roger S. Brown, Fred Singh, Ivan Newman, and Virgil Fulmer; now, therefore, be it

RESOLVED by the International Association of Milk, Food and Environmental Sanitarians that the members congratulate the Imperial County Health Department for its contributions in the area of health and in particular for outstanding achievement in the development of a comprehensive program of food and drink sanitation and upon being selected to receive the annual Samuel J. Crumbine Award.

REVIEW OF PUBLICATIONS SELECTED BY DAIRY FARM METHODS SUBCOMMITTEE

The Subcommittee on Education of the IAMFES Committee on Dairy Farm Methods has selected additional pamphlets, brochures and bulletins recommended to be of interest to sanitarians and fieldmen active in the field of milk production. This is the third of a series of abstracts of such publications considered to be valuable and useful as educational materials.

The publications selected by the Subcommittee are part of a total of some 200 received. The material was originally released by various university and state extension services, departments of health and agriculture, suppliers to the dairy industry and others. In the following abstracts the source of the material is indicated as well as the date of publication if available.

HYDROLITIC RANCIDITY—SOME CAUSES AND CONTROL

A release by the Extension Service of the Pennsylvania State University, this 3-page mimeograph reviews some of the more common factors in milking and milk handling that may produce a rancid flavor in milk. The author points out that hydrolitic rancidity is a deterioration of the breakdown specificially of butterfat in contrast to oxidative rancidity or other common bacteriological reactions. Freshly drawn milk from healthy cows is never rancid. However, the susceptibility of milk to go rancid varies widely according to individual cows under certain adverse conditions enumerated in the discussion. Control measures are suggested.

Rancid flavor in milk has become more prevalent in recent years and the author considers that modern methods of handling in bulk tanks, pipeline milkers and every-other-day pickup is at least partly responsible. Also certain milk handling methods favor rancidity development through excess "activation" of the milk. The paper concludes by listing do's and don'ts such as proper maintenance of inflations and milk hoses and pipeline connections, keeping milk flow rate as high as possible, selecting bulk tanks of proper size, keeping pipelines tight, avoidance of risers and unnecessary fittings, and minimizing of agitation and freezing in the bulk tank.

SANITATION IN THE PRODUCTION OF HIGH QUALITY MILK

In this third part of a series of publications by the Chore-Boy Division of Golay and Co. of Cambridge City, Indiana, the importance of a complete sanitation program in the production of high quality milk is emphasized. The earlier publications dealt with the principles of vacuum milking and its relation to production per cow and with recommended methods of milking, handling, feeding and housing of dairy cows.

Pointing out that the quality of milk and milk products ultimately determines the marketability and increased use and preference by consumers, this Part III reviews the basic principles of sanitation in herd health, the preparation and care of the cows during milking, the handling and cooling of the milk in production and the best recommended practices of cleaning and care of the milking equipment. Various methods of milking and pipeline cleaning are reviewed and the recommendations of the Chore-Boy company are enumerated.

In brief discussions factors such as rancidity in milk, and undesirable flavors and abnormal milk are covered. Considerable space in the 38-page booklet is devoted to mastitis, its diagnosis, testing procedures and steps for prevention and control. The scope and importance of the work of the National Mastitis Council is underscored.

The pamphlet is summarized by a review of the principal features of Chore-Boy equipment and systems and their advantages. 1964.

ANTIBIOTICS IN MILK—A REVIEW

Stating that the widespread use of antibiotics has contributed to the control of diseases and the nutritional well-being of livestock, the authors of this 29-page pamphlet, staff members of the Department of Dairy Science and Food Technology and the Col-

lege of Veterinary Medicine at the University of Illinois, indicate, however, that the use of antibiotics in the treatment of mastitis has sometimes created problems for the milk processor and consumer.

Following treatment of mastitis with antibiotics, they may be found in milk in sufficient concentrations to cause economic losses in cheeses and fermented products. Penicillin in small concentrations may cause reactions in highly sensitive individuals. A review of some nationwide studies and a discussion of testing methods is given in the article. Certain public health factors resulting from the use of antibiotics in milk including the development of sensitivity reactions, increase of resistance of bacteria to antibiotics and the possibility that dairy foods may be made from milk containing antibiotic-resistant bacteria.

The article reviews recommended methods for use of antibiotics and precautions in withholding milk for human use following treatment. After adulterated milk leaves the farm for the milk plant antibiotics may be variously affected by processing treatments. Antibiotics, the authors point out, are relatively stable to pasteurizing temperatures and low temperatures. In storage at refrigeration temperatures up to seven days, however, there tends to be a loss in activity. Several substances have been found that will inactivate penicillin and methods for neutralization are outlined.

Recognizing that a complete, critical review of the subject of antibiotics is beyond the scope of the article, the authors state that the purpose of this review is to bring together information on available literature. A listing of some 210 references follows the text. The pamphlet is a reprint from the Journal of Dairy Science, May, 1961, Vol. XLIV. No. 5, pages 779-807.

QUALITY STUDIES ON MILK COOLED IN FARM BULK TANKS

Published in 1958 this Bulletin No. 610 of the University of Vermont Agricultural Experiment Station summarizes studies during a five-year period of the quality of milk handled through bulk-tank systems. Clear evidence was found that although farm bulk milk is generally of superior quality because of more rapid cooling, many producers have delivered milk of lower quality after a bulk tank installation, according to the author.

Four separate studies were undertaken and the results of each study are discussed. The first study covered the quality of raw milk before and after conversion to farm bulk cooling. The second study was designed to obtain the temperature history of milk stored in bulk-milk cooling tanks and the third study undertook to compare the quality of farm bulk-cooled milk with that of combined deliveries in a bulk-pickup truck. Certain bacteriological factors were investigated on a limited basis in the fourth study.

From the studies it appeared evident that variations of milk temperatures in properly operated farm bulk tanks do not lower quality during an every-other-day pickup schedule. Also bulk transport probably has little effect on quality aside from some lowering of creaming ability. The bacteriological studies indicated that the standard plate count at 32 C, using either of two currently approved media, gave a valid estimate of the bacterial population. Psychrophilic bacteria appear to be primarily responsible for increases in total count during prolonged refrigerated storage.

RELATIONSHIPS BETWEEN MILK FAT RANCIDITY, SHORT CHAIN FATTY ACIDS, AND RANCID FLAVORS IN MILK

Based on data taken from an M.S. thesis presented to Oklahoma State University, this article is a 3-page reprint from the Journal of Dairy Science, June, 1963, Vol. XLVI, No. 6, pages 569-571.

It is known that rancidity is a combination of several flavors which can be caused by a variety of treatments. It is also known that free fatty acids are at least partially responsible for rancid flavors. Other studies have evaluated rancid flavors in connection with total milk fat acidity but, according to the author, the data from these studies have not always been presented in a manner to calculate the degree of relationship between acids and flavors. The subject experiment was designed so that statistical estimates could be obtained concerning the degree of relationship.

In the study rancid flavors were produced in the milk by various methods and free fatty acids were extracted by described methods. The article concludes that throughout the data the differences due to the treatment used to induce rancidity were larger than anticipated. In view of these differences, the applicability of findings developed under any given set of conditions to results under other conditions were questionable. There were variations in the organoleptic scores between judges and, although variations were not large, they did tend to reduce the size of the correlation coefficients so that the actual correlation may have been higher than indicated in the data.

PURDUE UNIVERSITY MIMEOGRAPHS

This is a series of four 2-page mimeographed releases by the Cooperative Extension Service, Purdue University, during January to April, 1964, designed for distribution to milk producers. The first release covers "Milking Machine Operation" and discusses the characteristics of milking machines, pointers for proper milking, pipeline and milk filter standards including outside the line and in-line filters. Essential practices for the producer to follow are summarized.

"Milking Management and Mastitis" is the subject of the second release and the most important factors of dairy farm operation and their relationship to mastitis and milk quality are enumerated. These include the general health of the milking herd, feeding practices and proper housing, milking order and care of the individual cows, preparation of the cows for milking and milking practices, the importance of cleaning and sanitation and care of equipment. The value of veterinary help is emphasized.

The third release covers "Milking Machine Maintenance." Pointing out that abuses in mechanical milking are major factors in the development of mastitis, this bulletin outlines the important features in a properly designed and operated milking system. Milking machine manufacturers are credited with major improvements to aid the dairyman but there remain many operating responsibilities of the producer. He is encouraged to know everything possible about how a milking machine works, the testing equipment available and at least routine maintenance procedures.

The last of the series of mimeographed releases covers "Tests for Mastitis." A brief discussion is given of the various forms of mastitis and some of the more commonly used tests are described. The release is designed to give the producer at least a minimum of practical information on mastitis.

USING FIELD MASTITIS TESTS TO IMPROVE MILK QUALITY

This is a 5-page mimeograph addressed primarily to the milk producer and is designed to familiarize him with the more commonly used rapid tests for the evaluation of milk based on its leucocyte (white blood cell) count. The California Mastitis Test, the Milk Quality Test and the Modified Whiteside Test are briefly described and procedures for running the tests and interpreting results are outlined.

Benefits of the tests and their importance to the farmer in controlling mastitis is emphasized. Steps to correct or eliminate adverse conditions are explained briefly. The producer is admomished to keep a jump ahead of the inspector and to use the tests to detect mastitis and other causes for high white cell count before these problems seriously affect the quality of milk being sold.

The mimeograph was released by the Extension Service of Pennsylvania State University.

QUALITY MILK AND CREAM ON THE FARM

Pointing out that to a great extent dairy equipment has been moved from the plant to the farm in recent years, this 6-page Circular No. A-405 issued by the Extension Service of North Dakota State University urges the producer to follow certain definite steps in order to market high quality milk and cream.

Quality production demands that the producer make a determined effort to: (1) Maintain good clean healthful conditions and keep cows well fed and healthy; (2) Keep milk and cream clean and free from "off" odors; (3) Use an efficient detergent and sanitizer and practice proper procedures in cleaning equipment, utensils and containers used in the production of milk; (4) Cool milk below 45 F within 2 hours after milking and keep below 45 F until delivered; (5) Maintain dairy facilities so as to make quality production a pleasure not a chore.

Recommendations for accomplishing these conditions are given in some detail in the folder which evidently is designed for milk production for manufacturing purposes as well as the Grade "A" market. 1962.

MISCELLANEOUS

Several publications in the form of short bulletins to producers or cards for use in milk houses were reviewed by the Subcommittee and considered to be of interest as educational material.

"Milking Machine Maintenance" is a 2-page mimeograph put out by the Extension Service of the University of Minnesota. It is actually a check-sheet designed to aid the producer in maintaining the vacuum pump, the sanitary trap or vacuum reserve tank, the vacuum controller, vacuum lines, stallcocks, drain valves, pulsators and teat cup liners. Step-by-step suggestions are given for accomplishing proper maintenance and operation. The producer is reminded that inasmuch as the milking machine is used every day, it must be kept in top operating condition to get all the milk, to reduce udder trouble and to save time. 1964.

"Milk Flavor Defects" is issued by the Extension Service of the University of Vermont in the form of a milk house card. It lists in three columns the

more common flavor defects, their probable causes and recommended steps for prevention. Presented in such a brief and easily read form, the information should be useful to the producer as a reminder to employ good milking practices. 1959.

"Dairy 3-Step Fly Control Program" is also in the form of a milk house card and is put out by Whitmire Research Laboratories of St. Louis, Mo. Utilizing a lay-out of a typical dairy farm set-up with the loafing and feeding areas, the barn, milking parlor and milk house, the chart endeavors to show common fly-breeding areas and steps recommended for control of fly production and spread into milking areas. The application of certain Whitmire insecticides is tied in with the chart, utilizing a color pattern to facilitate selection of the proper compound.

INTERIM REPORT OF THE COMMITTEE ON APPLIED LABORATORY METHODS — 1965

Goals for the Present 2-Year Committee

1. To provide assistance, wherever possible, in the preparation of the 12th Edition of *Standard Methods for the Examination of Dairy Products* and the 12th Edition of *Standard Methods for the Examination of Water and Wastewater,* and to serve as a sounding board for the IAMFES membership in regards to laboratory methodology to be included in both editions of *Standard Methods* as well as those now included in the 9th Edition of Official Methods of the Association of Official Agricultural Chemists (AOAC).

2. To be well informed on the subject of media certification and the programs suggested by APHA and others for implementing certification, and to provide an expression of the feelings of IAMFES when and where pertinent.

3. To develop a continuing program concerned with new laboratory testing procedures or the validation of some that already have been proposed for inclusion in the 12th Edition of *Standard Methods,* and to provide extremely valuable data in advance of preparation of the 13th Edition of *Standard Methods.*

4. To emphasize the need of IAMFES for an Applied Laboratory Methods Committee and establish new areas of interest where the best opportunities for committee contributions now exist. To restate all charges to the committee and provide specificity to the general objectives where necessary.

Activities

Participation in Revision of 11th Edition of Standard Methods: As shown in the interim report (J. Milk and Food Technol. June 1964) most of the A. L. M. committee are serving as chairman or subcommittee members in the preparation of the 12th Edition of *Standard Methods for the Examination of Dairy Products* (SMEDP). Final drafts of most of the chapters have been prepared and submitted to members of the various subcommittees for review prior to transmittal to chairman and vice-chairman of the APHA Subcommittee on Standard Methods.

Some of the changes of laboratory methodology in the revision of the 11th Edition of *Standard Methods* include incubation of plated dry milk samples at 32° C for 48 hours, incubation of plates for psychrophilic bacterial counts at 7° C for 10 days, and coliform counts of plates incubated at 32° C for 24 ± 2 hours. The A.O.A.C. methods I and II for determination of phosphatase have been deleted as well as the Scharer "one hour" laboratory method; the Modified Spectrophotometric, Cornell and Rapid Dialysis Methods have replaced the deleted methods.

Media Certification: Since the last report (June, 1964) of the Public Health Committee of the American Dairy Science Association, there has been no further progress on the development of protocol for check testing of viable count media by independent organizations in addition to industry evaluations. The coliform group chapter subcommittee recognized the need for certification of coliform plating and verification media. The use of various lots and brands of coliform media by some laboratories has indicated that the variability of growth inhibiting ingredients in these media inhibits growth of typical coliform bacteria. The development of criteria for the certification of coliform media should be considered and preemptive studies conducted to develop criteria for evaluating a suitable formulation of growth and inhibitory ingredients in these media. In this regard, there appears to be need for the ALM Committee to represent the International for APHA committee action on this subject.

Future Committee Responsibilities: Although it has been difficult, during the last five years, to establish a unified committee program due to the unavailability of committee members to meet and discuss problems related to the responsibilities of this committee, at some time other than the annual meeting, much information has been obtained through correspondence with individual members. The possibility of additional meetings of this committee, where necessary, will be considered in advance of annual meetings of the ADSA, APHA, and ASM.

Considerable efforts are being made by the U. S. Public Health Service, Food and Drug Administration, Association of Official Agricultural Chemists, and food microbiology organizations to establish uniformity in laboratory procedures for the examination of foods which may lead to Standard Methods for the Examination of Foods. Since the IAMFES is concerned with food sanitation as well as that of dairy products, it is natural that the Applied Laboratory Methods Committee should be concerned with the uniformity of food microbiology methods. Members of this committee have been requested, by the Chairman, to participate with A.O.A.C. referee laboratories in collaborative studies on food microbiology. The Applied Laboratory Methods Committee has also been requested by the Food Hygiene Committee of the FAO/WHO of the U.N. to assist in the development of microbiological standards for foods.

Due to the increased interest in food microbiology methods and standards, and the need for continued activities in laboratory methods related to the examination of dairy products, as well as water supplies and product-contact surfaces, the Chairman subdivided the Applied Laboratory Methods Com-

mittee into three subcommittees with Vice-chairmen responsible to the Committee Chairman; namely (*a*) Subsommittee on Laboratory Methods for the Examination of Milk and Milk Products which would be responsible for laboratory activities concerned with microbiological and chemical method studies; (*b*) Subcommittee on Laboratory Methods for the Examination of foods which would be responsible for laboratory activities concerned primarily with studies on microbiological methods, and chemical methods where applicable to foods other than milk and milk products; and (*c*) Subcommittee on Laboratory Methods for the Examination of water and other environmental samples. One of the immediate responsibilities of this subcommittee would be to study the use of membrane filtration for viable and coliform counts of rinse and/or swab solutions of product-contact surfaces which are required in item 12p of the Grade A Pasteurized Milk Ordinance recently published by The U. S. Public Health Service. Although some committee members may have responsibilities on all committees due to their background and/or motivation, it will be necessary to obtain additional qualified subcommittee members to fulfill the responsibilities of each subcommittee.

This committee was also requested by the American Standards Association (ASA), U.S.A. Member Body of the International Standards Organization to advise the ASA how to vote on apparatus (cheese triers and butter triers) for testing milk and milk products which have been recommended as International Standards. Due to the need for quick transmittal of reply, it was not possible to consult with fellow committee members, and as a result, the chairman voted approval of the recommended apparatus following consultation with a sampling expert.

Recommendations

It is recommended that additional IAMFES committees be formed with responsibilities applicable to food production, processing, and distribution sanitation problems. The Food Hygiene Committee of the FAO/WHO has also expressed interest in food sanitation problems and has solicited the Applied Laboratory Methods Committee for assistance in these problem areas. Because of the need for advisory assistance, due to the everincreasing technological changes in milk and food processing, the various committees within the IAMFES can contribute significant information towards answering potential sanitation problems.

The IAMFES should, in its official capacity, recommend that government agencies provide support, financial and otherwise, for ALM committee collaborative studies on laboratory methodology concerning dairy products, foods, air, water and other environmental fields.

The committee solicits the comments of IAMFES members relative to any of the above described activities.

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NEWS AND EVENTS

REPORT ON WATER POLLUTION IN CONTINENTAL SHELF REGIONS

The Environmental Science Services Administration (ESSA), U. S. Department of Commerce, has released a comprehensive study of economic activities including those related to waste disposal, water pollution, and shellfish sanitation—in the regions of the United States' continental shelf.

The report was prepared by the Battelle Memorial Institute of Columbus, Ohio, under contract from ESSA's Coast and Geodetic Survey. Objectives of the study were to assess the present economic value and future growth potential of activities on the continental shelf and to evaluate the present and future needs of these activities for products and services provided by ESSA.

United States coastal waters serve as a recreation area and as a source of seafood. At the same time, these waters are a dumping ground for the wastes of nearly a third of the U. S. population and the vast industrial complex located within 50 miles of the coast. As the population increases, the report predicts, indiscriminate waste-disposal practices could seriously threaten the use of the oceans as a food source.

Although only 30,000 people are directly employed in the shellfish industry, some 250,000 people are dependent on it for their income, and the annual community worth of the industry is estimated at between $200 and $250 million. The Public Health Service told the Battelle researchers that one-tenth of the acreage suitable for shellfish culture cannot be used because of pollution. In some areas, commercial shad and oyster fisheries have been wiped out by pollution of rivers and estuaries.

The study concludes that waste disposal, water pollution, and shellfish interests have a critical need for three-dimensional information on current motion from the bottom to the surface in estuaries, bays, and harbors. With sufficient understanding of such currents to be able to predict the diffusion of pollutants, waste disposal in coastal waters could be managed efficiently to avoid endangering recreation and food production. In 1964, the report estimates, $335 million was spent for disposal of wastes on the continental shelf. New York City's annual budget for sewage treatment and disposal is $13 million. The Metropolitan District Commission, which serves the Boston area, has an $8 million total annual budget for sewage treatment and disposal.

Pollution control and shellfish sanitation cost an additional $6.5 million. Almost half of this amount is spent to ensure that sanitary standards are maintained in waters used for recreation. The balance is the cost of the shellfish sanitation program, conducted by the Public Health Service, state health departments, and the shellfish industry.

The Environmental Science Services Administration, a new agency created in 1965 by merging the Weather Bureau, the Coast and Geodetic Survey, and the Central Radio Propagation Laboratory of the National Bureau of Standards, provides among other services nautical charts, tidal and current information; seismological, geomagnetic, gravity, hydrographic, and oceanographic data; and navigation and engineering positional data.

In planning and designing sewage treatment plants, tide tables, current tables, tidal current charts, and harbor charts are essential. They are used to determine what type of treatment is required, how much treatment is needed, and where to locate waste outfalls. Tidal and current tables are indispensable to the shellfish sanitation program in establishing sampling techniques and determining the number and location of sampling stations.

The report, *Development Potential of U. S. Continental Shelves*, is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. Price: $1.25 per copy.

NEW SYSTEM OF SILAGE STORAGE HAS ADVANTAGES

A new method of silage storage which promises to change age-old silage methods as well as the most modern, is being introduced in this country. Silage 400%, according to National Cooperatives, Inc., Albert Lea, Minn. Lush grass, dry stalky pasture, wilted alfalfa, field corn, oats or pea vines are stored and costs come down considerably, a saving of 300% to kept in an extremely palatable state; high in lactic acid. This silage stack remains fresh and sweet over long periods of time.

What is the new system? The farmer selects any level land where it would be convenient to have silage storage, lays a tough plastic sheet on the ground, and stacks his silage on top of the plastic sheet. Up to and exceeding 300 tons may be stacked on the sheet. After the stack is complete, another sheet of plastic film is stretched over the top. The edges of this are zip-sealed to the edges of the bottom sheet with a patented seal. An air hose, which had been inserted into the stack, is connected to a silage vacuum pump and the air is drawn out or evacuated from the stack.

This is the key to the entire system. When the air is pulled out of the stack, the stack compresses to about half its height. Silage under vacuum keeps entirely different from ordinary silage. Under vacuum, silage plant life ceases; there is no heat. There is no fungus growth or propagation of insects. The stack remains fresh and sweet over long periods of time.

Under vacuum, compression results in even fermentation. There is no burning away of sugar. Some carbon dioxide remains in the stack and serves two functions. Being heavier than air it prevents air from entering the stack and the carbon dioxide maintains the silage in a fresh, unspoiled condition. Because the vacuum keeps the stack below the temperature range of active bacteria, the farmer gets unspoiled silage high in lactic acid and extremely palatable.

The plastic film is made to the quality specifications of the CO-OP Brand by Gering Plastics Company, a department of the Monsanto Company, St. Louis, Mo. The vacuum pump is made by the farmer-owned Universal Milking Machine Division of National Cooperatives, Inc.

There is the utmost flexibility in the use of the vacuum compression system of silage storage. The farmer may put his stack in the open, in a barn or lean-to almost anywhere convenient to the farmer, animal comfort and maximum accessibility of livestock and feed to feeding areas.

Harvesting can be intermittent. One man can work on a stack daily and evacuate each night without undue heat occurring. Harvesting can be discontinued and resumed at a later date for continued vacuum compression of newly cut silage. The top cover can be rolled back daily for refill without ill effect on the previously vacuum processed silage in the stack.

Horizontal layering of various silage crops as they are harvested and stacked over previously compressed vacuum silage gives a complete admixture of the season's crops. As the silage is fed out in vertical cuts across the ration, a uniform feed is made available. If a finish concentrate is desired, it can be added at the far end of the stack for final feeding.

Although forage is cut, it continues to live, respire, and use up food energy. This respiration continues to break down sugars and other digestable carbohydrates. When the ordinary silage is stacked, temperature in the stack may rise to 130° accelerating the loss of sugar and other digestible carbohydrates to the extent that the weight of the material may be reduced 25% to 40%.

Vacuum compression of silage, on the other hand, causes immediate suffocation of plant respiration. This conserves sugar levels for lactic acid production. Vacuum compression of silage, also, generally keeps stack temperatures below 85°F. This is below the blood-heat range which checks the growth of putrefactive bacteria and permits lacto bacilli to operate without competition to produce lactic acid rapidly without air.

Under the vacuum compression of silage system because sugar is not destroyed by respiration or oxidation or by competition with aerobic bacteria and molds a wider range of herbages can be successfully ensiled. Legumes, clover dominant pastures, pea vines and low sugar plants when wilted slightly have made excellent vacuum silage.

PORTABLE MILK TRANSFER STATION

"A portable milking system on wheels" is the description of the new line of Perfection Transfer Stations, made by the Perfection Division, Sta-Rite Products, Inc., Delavan, Wisconsin.

These transfer stations, according to the manufacturer, cost less than one-fourth as much as "in-place" pipeline systems, yet provide all the step-saving advantages of a permanently installed system. Perfection Transfer Stations roll right along the milking stalls. Milk is poured from buckets directly into the transfer station tank, from which it is either pumped to the bulk cooling tank or drawn out by vacuum using the existing vacuum system. Trips back and forth to the milk house with heavy milker buckets are completely eliminated.

Perfection Stations are provided with 100 feet of clear plastic hose, to reach from the bulk milk cooler to the farthest stall in the barn. After milking, the entire unit can be sanitized and flushed in place. It can even be dried, using the new Perfection Electric Hose Drier which dries hose quickly and efficiently. In-line milk filter is also completely washable.

For the manufactured milk market, Perfection also makes a portable transfer station. Claw or pipeline milkers can be attached to cows, with unit milking directly into the transfer station. When the receiving chamber is full, the pump turns on and the milk is pumped directly to the bulk tank.

For further information about Perfection Transfer Stations or other Perfection dairy equipment, including "Stop Watch" automatic milkers, write Perfection Division, Sta-Rite Products, Inc., 651 South Eighth Street, Delavan, Wisconsin.

BRUCELLOSIS ELIMINATED IN WISCONSIN

According to an announcement by the U. S. Department of Agriculture, Wisconsin has become the first of the major dairy states to have eradicated brucellosis and to be certified as Brucellosis free as defined by standards of the USDA.

Maine, New Hampshire, Rhode Island, Connecticut and Utah as well as the Virgin Islands previously have been designated as brucellosis free areas. Wisconsin's achievement is especially noteworthy inasmuch as, with its 4,500,000 head, it has four times the total cattle population of the other states qualified.

In addition to the states named 298 counties in 19 other states and Puerto Rico have been declared free, according to the announcement. Furthermore, 37 states have achieved the status of Modified Certified Brucellosis Areas by reducing incidence of the disease to less than 1% of the cattle population.

Eradication efforts in Wisconsin were begun a number of years ago but were reduced during World War II. Programs were resumed but progress was comparatively slow until the Chicago Health Department in 1950 set a requirement that by January 1, 1955 all milk for the Chicago consumption had to come from brucellosis free herds. Several other markets took similar action.

The development and use of the "ring" test as a fast screening method also gave impetus to the program. An intensified campaign county by county was put into effect with two ring tests a year required. The first test of the new program showed

41.4% of the herds tested to have infected animals. By 1952 reactors averaged about one in ten. On the 29th and latest complete test reactors were .154 of 1%, considered almost a minimum. Complete eradication is expected by 1970, assuming that infection from outstate can be controlled.

Some statistics on the successful program are of interest. It is estimated that since 1951 some 2,000,000 milk samples were taken, 885,000 herd tests with 18,000,000 animals, 6,000,000 calves vaccinated and in excess of 861,000 reactors removed. The cost of the program since 1951 approximates $31,345,000 but this is easily offset by an estimated brucellosis loss in one three year period of $40,000,000 in milk and calves.

According to the USDA report there were more than 300 cases of human brucellosis—undulant fever—reported in Wisconsin in 1948. Only two cases have been reported this year.

Robert B. Barrett

CHANGES IN KLENZADE MANAGEMENT PERSONNEL

Marion E. Shepard

Robert W. Goodwin, Vice President and General Manager, Klenzade Products Division of Economics Laboratory, Inc. has announced the following organizational changes: Robert B. Barrett to Vice President and Administrative Assistant; Marion E. Shepard to Vice President and Director of Food Plant Programs; Larry A. Timm to Beverage Sales Manager; John W. McNeil and H. Glenn Weavers to Area Sales Managers; David K. Fricke to Manager, Dairyland District; Fred W. Stege to Manager, Northeastern District and James R. Welch to Assistant Manager, Farm Sales.

Stege's district office will be Boston, Massachusetts, while the remaining men will work out of Klenzade's home office in Beloit, Wisconsin. Klenzade manufactures and markets a complete line of sanitation chemicals and application systems for the dairy, food, and beverage industries. Manufacturing plants are located in Beloit, Wisconsin; Chicago, Illinois; San Jose, California; Lyndhurst, New Jersey; and Dallas, Texas.

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(act of October 23, 1962; Section 4369, Title 39, United States Code)

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H. L. Thomasson, Managing Editor

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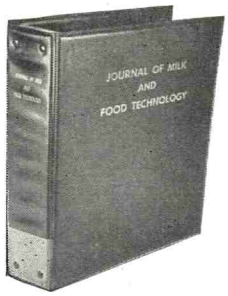

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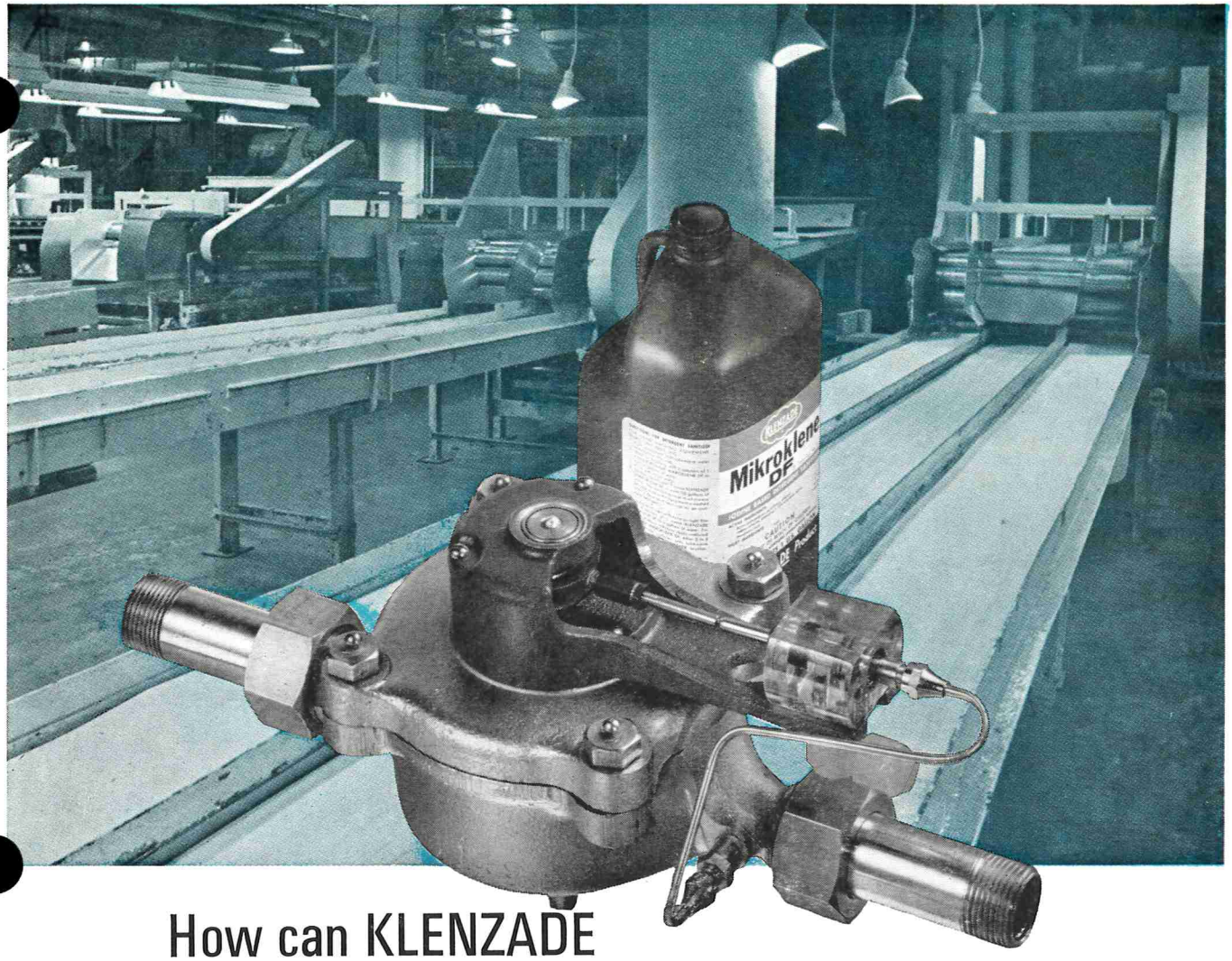

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