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56TH ANNUAL MEETING
August 18, 19, 20, 21, 1969
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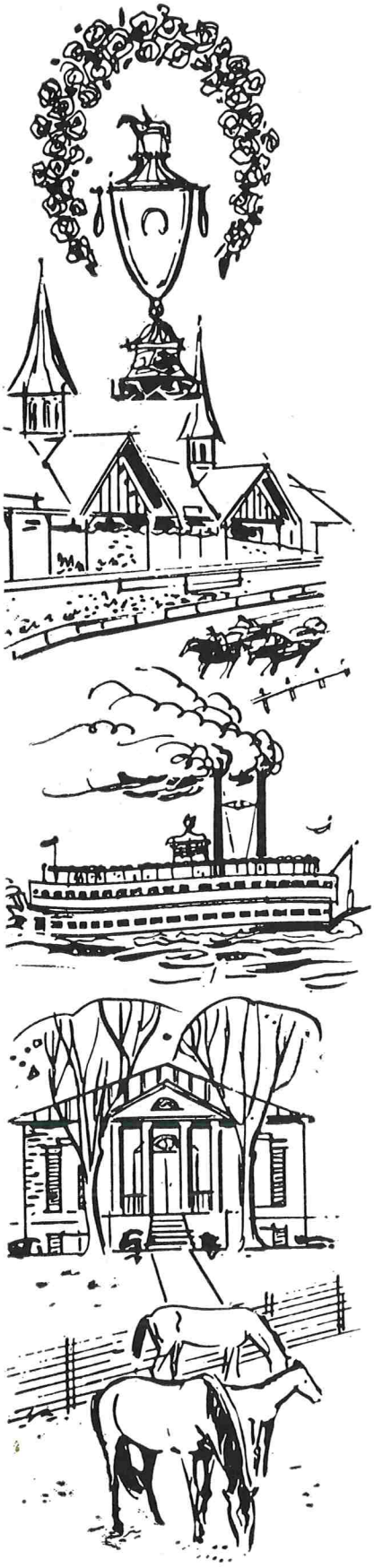

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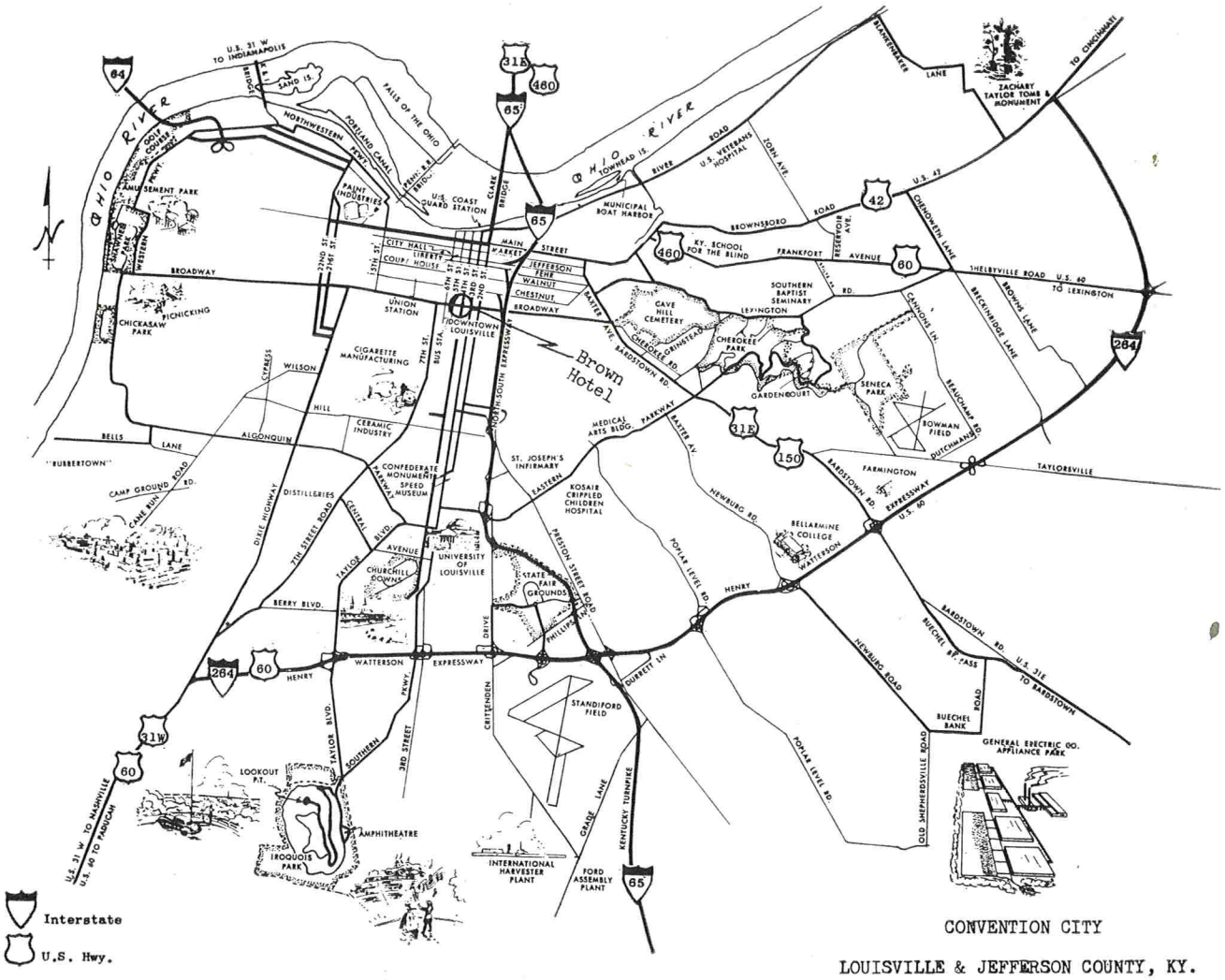

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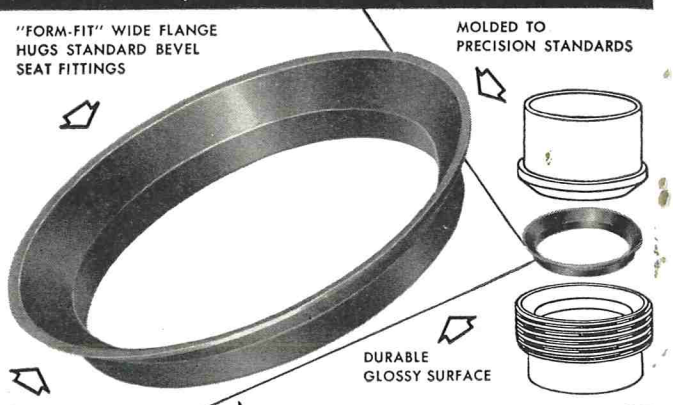

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USE OF VISUAL AIDS IN EFFECTIVE TRAINING[1] OF FOOD-SERVICE MANAGEMENT[2] IN FOODBORNE DISEASE CONTROL[3]

FRANK L. BRYAN

U. S. Department of Health, Education, and Welfare
Public Health Service
Health Services and Mental Health Administration
National Communicable Disease Center
Atlanta, Georgia 30333

Author's Note: When I was asked to present this session at the 55th Annual Meeting of IAMFES, I asked why the planning committee wanted a session on Visual Aids. The answer: "Because the meeting was to be held in Missouri, the show-me state, and visual aids are the best way to communicate with folks in that area."

Are Missourians any different from people elsewhere in wanting to be shown? I don't think so—they are just a little more frank about demanding visual proof. It is difficult enough to describe many common, everyday objects; if a group is unfamiliar with an object or its use, the difficulty is compounded. But a picture, a drawing, or the actual object demonstrated readily communicates the thought to an audience. And it is easier to describe familiar things than bacteria, which the audience cannot see, or a concept such as "cleanliness is a way of life." Visual aids can assist in meeting these communication challenges. Because the effective use of visual aids is such a large subject, I will limit my discussion to the correlation of visual aids to training methods appropriate in training food-service managers.

In the development of any program (including training) determining needs, setting goals, and defining objectives are initial steps in the administrative process. The need for training food-service managers is obvious because numerous foodborne disease outbreaks result from meals served in food-service establishments. These outbreaks are caused by breakdowns in operational procedures such as failing to properly refrigerate potentially hazardous foods; allowing foods to remain at warm temperatures that promote bacterial growth; failing to adequately cook or heat process foods; transferring contamination, by equipment and workers' hands, from raw foods of animal origin to cooked foods or to foods that require no cooking; failing to properly clean and disinfect kitchen equipment; infected workers who practice poor personal hygiene; and careless storage practices. Food-service managers are responsible for the day-to-day operations within food-service establishments; they are important because they can establish safe procedures and can prevent breakdowns of these procedures. They must be informed of, and accept the principles of, foodborne disease control before they will advocate and supervise safe food-preparation practices. Training of food workers has met with continued frustration because of the tremendous turnover of personnel in the food-service industry. Food-service managers often have the capability of solving foodborne disease problems inherent in their operation, and training can stimulate them to initiate needed change. The overwhelming reason to train managers, however, is that they are the group who can effect change in food-service establishments.

OBJECTIVES

For long-range goals, training should eventually reach all food-service managers. Managers of those establishments that serve the majority of the public should be included in early stages of the training project. Managers from establishments where outbreaks have occurred, or where health problems are likely to occur, should also be included in the initial seminars.

Typical objectives for a food service (or food processing plant) managers' training course are listed in Table 1.

These objectives are stated in terms of desired trainee responses and include acquisition of information, skills, and attitudes.

TOPICS

Another crucial step in course planning is selection of topics. Each topic should contribute in some distinct way to the accomplishment of one or more of the objectives. Suggested topics in relation to public health and foodborne disease control for a food-service managers' training course are listed in Table 2.

---

[1]For the purpose of this paper, training is defined as acts, processes, or methods used to bring about the acquisition of knowledge, skills, and/or attitudes in food-service managers for the purpose of modifying or improving work behavior.

[2]Food-service management is considered as the collective body of individuals who get things done in food-service establishments by supervising the work activities of other people.

[3]Presented at the 55th Annual Meeting of the International Association of Milk, Food, and Environmental Sanitarians, Inc., St. Louis, Missouri, August 18-22, 1968.

TABLE 1. OBJECTIVES FOR FOOD SERVICE (OR FOOD PROCESSING PLANT) MANAGERS TRAINING COURSE

Acquisition of information

1) Understand sources and modes of spread of major foodborne pathogens of concern to the industry.
2) Learn methods of minimizing contamination or preventing recontamination of foods by pathogens at all steps of the operation.
3) Learn methods of inhibiting growth of foodborne pathogens at appropriate steps of the operation.
4) Learn methods of destroying foodborne pathogens at appropriate stages of food processing.
5) Become aware of reliable sources of information, materials, training aids, and assistance for training line supervisors and workers.

Acquisition of skills

6) Develop skills in managerial procedures that facilitate a sanitary operation.

Acquisition of attitudes

7) Become aware of the economics of sanitary practices.
8) Realize that the supervisory health agency can, and is willing to, assist in solving many health and sanitation problems and serve as consultants and trainers (develop a better understanding of the health department's food hygiene program).
9) Develop an attitude of social and public health responsibilities for the foods prepared, stored, or sold.
10) Become motivated to implement training of personnel.

TABLE 2. SUGGESTED TOPICS FOR FOOD-SERVICE MANAGERS' TRAINING COURSE

1) Important foodborne diseases of concern to the industry (staphylococcal intoxication, salmonellosis, *Clostridium perfringens* foodborne illness)
2) Equipment layout, design, and construction
3) Operational flow in food-service establishments (disease control and related sanitation activities)
   a. Food sources, menu planning, and purchasing
   b. Receiving and storing
   c. Preparing and cooking
   d. Hot holding, chilling, and serving
   e. Disposition of leftovers
4) Cleanup and sanitary maintenance of equipment
5) Personnel management, supervision, and training

Both the topics and objectives probably would have to be modified to cope with specific community food hygiene problems or to conform with a particular health department's food hygiene program; however, they will serve as examples. Based on the objectives, specific desired outcomes (not shown in Table 1) for each topic may be further stated in measurable terms to serve as the basis for evaluation of a course.

Before a seminar is presented, or at the start of the first session, a discussion could be held with the managers to get them to identify their health-related responsibilities and to understand the manner in which these responsibilities can be successfully discharged. A chalkboard, flipchart, or overhead transparency can be used for listing responsibilities and methods of control. Such a session can contribute to the identification of needs for the course.

The following resume of the five topics includes mention of visual aids which could enhance presentations. A few of these training aids may be obtained from governmental or commercial sources, but most can be developed at a low cost by the local health agency or the institution that is sponsoring or presenting the course. A summary of visual aids that have been used to enhance each topic is presented in Table 3.

IMPORTANT FOODBORNE DISEASES OF CONCERN TO THE INDUSTRY

In most U. S. communities, the important foodborne diseases of concern to the food-service and food-processing industries are staphylococcal intoxication, salmonellosis, and *Clostridium perfringens* foodborne illness. Slides can be developed to indicate the national, state, or community scope of the foodborne disease problem. They can also highlight the epidemiology of the foodborne diseases. Data from summary reports of foodborne outbreaks, reviews of typical outbreaks, pictures of important sources of organisms, and newspaper clippings of local events are useful slide material. Facts concerning the foodborne diseases are presented not only for the trainees to use to solve problems, but also because they influence the trainees' attitudes toward solving their own problems. Overhead projectuals illustrating the pertinent facets of a foodborne disease outbreak can be used as the basis of a class discussion in which the cause of the outbreak is determined. The problem is initiated by the instructor, then projectuals are used (but only when called for by the group) to supply all the information that is needed to solve the problem.

Few recent films are available on the subject of foodborne diseases. One film, *The Epidemiology of Salmonellosis in Man and Animals*, (M-558)[4] does show the broad scope of the salmonellosis problem. This film must be interpreted, however, to emphasize to food-service managers the salmonellosis hazards confronting their industry. Films illustrating foodborne outbreaks, *An Outbreak of Salmonella Infection* (M-148a)[4] and *An Outbreak of Staphylococcus Intoxication* (M-148b)[4], can be used to introduce a disease problem. After showing each film, the audience can be asked to suggest appropriate control

[4]Source: U.S. Department of Health, Education, and Welfare, Public Health Service, National Library of Medicine, National Medical Audiovisual Center, Atlanta, Georgia 30333.

TABLE 3. VISUAL AIDS AND TRAINING METHODS DEMONSTRATED OR MENTIONED FOR EACH SESSION

SESSION	*TRAINING METHOD*	*TRAINING AID*
Operator's Health Responsibilities	Discussion	(Chalkboard)*
		(Overhead Transparencies)
		(Flipchart)
Diseases	Lecture	Overhead Transparencies
		Slides
		(Motion Pictures)
		Outlines
		Brochures
	Discussion	(Chalkboard)
		Hook-and-Loop Displays
Layout	Lecture	(Chalkboard)
		Overhead Transparencies
		(Slides)
	Group Workshop	Problem Statements
		Templates
		Hook-and-Loop Displays
		Infrared Copying Machine
	Discussion	Overhead Transparencies
		Filmstrip
Operational Flow	Lecture	Hook-and-Loop Displays
		Slides
		Overhead Transparencies
		(Filmstrips)
		(Motion Pictures)
		(Outlines)
		Demonstration Material
	Discussion	(Chalkboard)
		Overhead Transparencies
Sanitary Maintenance	Lecture	(Slides)
		(Overhead Transparencies)
		(Chalkboard)
	Group Workshop No. 1	Problem Statements
		Infrared Copying Machine
		Overhead Transparencies
	Group Workshop No. 2	Same as above
		Demonstration Equipment
		Photographs
		Slides
	Discussion	(Chalkboard)
		Slides
Management	Lecture	Overhead Transparencies
		(Slides)
	Group Involvement	Open-End Films
		(Role Playing)
		Fact Sheet Forms
		Problem Statements
		(In-Basket Technique)
		Inspection Form
		Overhead Transparencies with Overlays
		(Chalkboard)

*( ) Not shown during presentation of paper.

features for each disease. A hook-and-loop board and placards, or an overhead transparency with overlays—or a chalkboard—can be used for this summary. Under each disease category, the principles of control can be listed or checked. This technique stimulates discussion, leads into the control aspects of the seminar, and gives the instructor some idea of the understanding of the group.

EQUIPMENT LAYOUT, DESIGN, AND CONSTRUCTION

There is considerable interest and value in the use of training problems designed for group solution in the classroom. Working groups offer an opportunity for trainees to become involved and promote assimilation of knowledge acquired through lectures or other means. This procedure can be illustrated through an example containing a session on kitchen layout. At the beginning of such a session, a short introductory lecture on the fundamentals of kitchen layout is presented. The class is then divided into groups. Each group is given an outline plan of a kitchen and a set of templates representing equipment to be included in the kitchen. The plan and templates are cut from a printed illustration of the solution of the problem. Templates are hinged on the back with Scotch tape, and these templates may be stuck down and moved from place to place. After groups have arrived at a decision on the arrangement, transparencies of the solutions are made on positive heat-sensitive plastic film in an infrared copying machine which should be made available in the classroom. The group solution is projected on a screen by an overhead projector. A spokesman from the group can report on the arrangement without turning off the lights, moving away from the projector in the front of the room, interrupting the projector beam, or turning his back to the class. The solution is then evaluated by the entire class.

Following all the group presentations, a filmstrip *Basic Principles of Kitchen Layout* (F-148e)[5] is shown, a solution sheet is handed out, and a final discussion is held. There is no claim that the school solution is either ideal or compatible with current architectural practices—but the objective of the exercise, to get managers to think about an efficient, sanitary kitchen layout that minimizes the opportunities for cross contamination and facilitates cleanup, has been accomplished. With permission from publishers, additional plans and problems can be developed from modern designs and layout arrangements printed in journals or books. At completion of the exercise, the class is in a frame of mind conducive for discussion, and factors of sanitary design and construction of equipment or other related topics can be discussed.

[5]Source: U.S. Department of Health, Education, and Welfare, Public Health Service, National Library of Medicine, National Medical Audiovisual Center, Atlanta, Georgia 30333.

OPERATIONAL FLOW IN FOOD-SERVICE ESTABLISHMENTS

Hook-and-loop displays are ideal visual aids for a topic that can be taught in stages and built up as a lecture progresses. A series of printed cards or illustrations are attached to the board at appropriate intervals in a presentation. Typical restaurant or food-service operational flow, illustrated in Fig. 1, is an example of hook-and-loop subject matter. A strip of "hooks" is glued to the back of a card or object. Light pressure on the object against the board imbeds scores of "hooks" into the "loops," (a dense tangle of fibers in the cloth on the board), and the object or placard adheres to the board. The hook-and-loop board is very useful for displaying objects and demonstration materials. A substantial weight can be supported by only a square inch or so of hook-material. For most purposes, hook and loop boards are superior to flannel or magnetic boards.

The most important aspects of practical foodborne disease control can be presented as each step of the operational flow in food-service establishments is discussed. This approach can make the principles of foodborne disease control become meaningful in terms of the everyday activities of food-service managers. The control of foodborne diseases should include information about minimizing contamination of foodstuffs, preventing recontamination of cooked foods, inhibiting multiplication of pathogens by prompt and adequate chilling or hot holding of prepared foods, and thorough cooking to destroy pathogens. Slides, flipcharts, or additional hook-and-loop displays can be used to illustrate additional details about foodborne disease control at each stage of food-service operation. These visual aids can be prepared

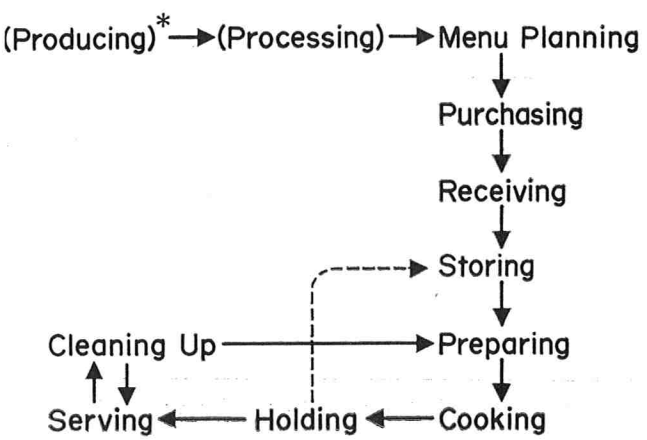

Figure 1. Operational flow in restaurants. *( ) Processes that occur outside the restaurant.

easily by any health agency and can be made to stress aspects of food-service operations that are the greatest problem in the community where the instruction is being conducted.

CLEANUP AND SANITARY MAINTENANCE OF EQUIPMENT

A problem that is continually noted by sanitarians during routine inspections of food-service establishments is that kitchen equipment is improperly cleaned or disinfected. One factor that contributes to this is a food-service operator's failure to systematize cleaning operations. An effective approach in teaching corrective measures in this area is the use of a group problem. The subject is introduced by a lecture featuring findings of local surveys or inspections, outbreaks associated with failure to adequately clean equipment, potentials for cross contamination, and values and techniques used in sanitary maintenance scheduling. Examples of sanitary maintenance schedules that have been prepared by industry and problem situations are distributed and discussed by the instructor. Next, groups are asked to develop a schedule. An overhead transparency is made (pencil —not ink—copy is required when making most infrared-processed transparencies). Transparencies are projected, and a spokesman from selected groups discusses the group's schedule. Following critiques of each presentation, the instructor makes final remarks to review important points and to clear up misunderstandings. Pen and pad (flipchart) can be substituted for the projectual if a copying machine is not available.

How to clean a piece of equipment effectively is a question that often comes up in discussions with managers. One way of handling this problem in a training class is, once again, through a group exercise. Following a short lecture, the class is challenged to develop a protocol for cleaning and disinfecting a piece of equipment, such as a meat-slicing machine. The machine may be displayed or pictures of it made available to the class. Groups of managers then develop a step-by-step procedure for cleaning the machine, stating the equipment and materials needed for cleaning. A transparency of the solution is made, and it is projected during the presentation by a spokesman. Following a critique by the class, a step-by-step disassembling, cleaning, and assembling procedure can be summarized by the instructor. A demonstration of disassembling and cleaning, or slides illustrating these operations, can enhance this final presentation.

Either or both of these group exercises can get managers involved and interested in effective ways of cleaning equipment. Sanitarians can follow these problem sessions with a discussion and answer questions on cleaning procedures.

PERSONNEL MANAGEMENT, SUPERVISION, AND TRAINING

Training in personnel management and supervision can be done by such methods as open-end films, buzz group problem solving, or role-playing situations, as well as group exercises. A portion of a film can sometimes be a more effective training aid than the entire feature. For example, film clips can be used to introduce a situation, and when the film is stopped, class members take the parts of the actors and continue the discussion with their neighbors. After trainees continue the discussion for a brief period, the problems or successes in the relationship are listed on a chalkboard and summarized by the instructor. This teaching method does not put as much pressure on trainees as does role playing, and a trainee will not become embarrassed in front of the entire class.

Another technique is to have class members write out a communication problem that they have faced or might anticipate. Pertinent data in the problem statement might include such information as the place, persons involved and their acquaintanceship, the problem situation, and the communication goal. Problem situations that bring out points compatible with course objectives are selected and given to groups of 4 to 6 people for discussion. These group discussions pool many ideas and will often involve the quiet student who will not speak out in class. Flipchart paper or overhead transparencies are used to aid presentations by group spokesmen.

The situations that could be used for these group involvement exercises might deal with such matters as getting an employee to practice better personal hygiene or to do a better job of cleaning, or getting managers to improve or develop self-inspectional programs.

If self-inspectional procedures are taught, class members can make practice inspections, or review slides of a detailed tour through a typical food-service establishment. After completing these real or simulated inspections, inspection forms can be filled out. Overhead transparencies of blank inspection forms, overlayed with a clear sheet of film, are used to record with wax pencil the inspection findings of class members so that they can be compared and discussed. Wax pencil is easily erased from plastic film so the film may be used again. Repetition of this exercise can lead to standardization of inspection findings among the group.

Because each manager is responsible for training employees under his supervision, a session on person-

nel training would be an adjunct to a course for food-service managers. Sources of visual aids having foodborne disease control significance can be enumerated. In problem-solving sessions, managers can be asked to develop a training program for food-service workers. Group solutions can be presented with the aid of overhead transparencies or flipcharts.

CONCLUSION

There are many methods of teaching. Only a few have been reviewed in this paper. The lecture is the most frequently used, but it is often a poor method if it is not enhanced by good visual aids. People learn better when they are involved. The visual aids and teaching situations that were discussed are not a "bag of tricks' but are training tools that help to involve trainees.

"Missourians have known what they've been talking about all the time when they say 'show me . . . .' (and ask for the use of visual aids).'

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Training courses offered by the Public Health Service Training Institutes in Cincinnati, Ohio—July 1, 1969 - June 30, 1970. For information concerning the Environmental Control Administration Courses write to Environmental Control Administration, Training Institute, P. O. Box 30200, Cincinnati, Ohio 45230. For information concerning the milk and food courses of the Food and Drug Adminitration write to Food and Drug Administration, Training Institute, 222 E. Central Parkway, Cincinnati, Ohio 45202.

Milk and Food Protection Training

Current Practices in Food Protection (331)—Lubbock, Texas, July 14-18, 1969.
Management Aspects of Food Protection (314)—Dallas, Texas, July 21, 25, 1969.
Laboratory Analysis of Milk and Milk Products I (300)—Davis, Calif., July 21-25, 1969.
State Milk Laboratory Survey Officers Workshop (303)—Salt Lake City, Utah, July 28-August 1, 1969.
Current Practices in Food Protection (331)—Wheaton, Ill., August 11-15, 1969.
Milk Pasteurization Control and Tests (302)—Fort Worth, Tex., Aug. 12-14, 1969.
Milk Pasteurization Control and Tests (302)—Cincinnati, Ohio, Sept. 8-12, 1969.
Special Analytical Techniques in Environmental Media—Gas Chromatography (710)—Cincinnati, Ohio, Sept. 15-19, 1969.
Laboratory Analysis of Milk and Milk Products I (300)—Cincinnati, Ohio, Oct. 20-24, 1969.
Laboratory Analysis of Milk and Milk Products II (365)—Cincinnati, Ohio, Nov. 17-21, 1969.
Management Aspects of Food Protection (314)—Cincinnati, Ohio, Jan. 5-9, 1970.
Pesticide Residue Analysis of Foods (311)—Cincinnati, Ohio, Jan. 19-23, 1970.
Special Analytical Techniques in Environmental Media-Thin Layer Chromatography (711)—Cincinnati, Ohio, Feb. 2-4, 1970.
Egg Pasteurization Procedures (370)—Cincinnati, Ohio, Feb. 9-13, 1970.
Technology of Food Protection (374)—Cincinnati, Ohio, Mar. 9-13, 1970.
Food Microbiology (310)—Cincinnati, Ohio, Apr. 6-17, 1970.
Special Analytical Techniques in Environmental Media—Atomic Absorption (712)—Cincinnati, Ohio, June 1-3, 1970.

The following courses may be negotiated with the requesting agencies through the appropriate PHS Regional Office.

Milk Pasteurization Controls and Tests (302)
Management Aspects of Food Protection (314)
Current Practices in Food Protection (331)
Institutional Sanitary Food Service (330)
Sanitary Food Service (335)
Shellfish Patrol Activities (122)
Shellfish Growing Area Survey Procedures (125)
Sanitary Control of Shellfish (121)
Administrative Aspects of Shellfish Sanitation (123)

ENVIRONMENTAL CONTROL ADMINISTRATION, TRAINING INSTITUTE

Community Environmental Management Branch

Administrative Aspects of Housing Hygiene (384)—Cincinnati, Ohio, Dec. 1-5, 1969.
Principles of Accidental Injury Control (475)—Cincinnati, Ohio, Sept. 15-19, 1969.
Safety in the Laboratory (480)—Cincinnati, Ohio, Nov. 17-21, 1969.
Generating Community Action (420)—Cincinnati, Ohio, Dec. 8-12, 1969.
The following courses to be announced:
Basic Housing Inspection (381)—one week.
Individual Water Supply and Sewage Disposal (382)—3 days.
Recreational Sanitation (383)—one week.
Urban Rat Control (906)—one week.
Mosquito Control (907)—one week.
Insect Control (908)—one week.
Insect and Rodent Control (909)—two weeks.

Solid Waste Management Branch

Elements of Solid Waste Management (655)—Cincinnati, Ohio, Aug. 18-22, 1969.
Incineration—Design and Operation (675)—Cincinnati, Ohio, Sept. 22-26, 1969.

(Continued on Page 252)

BAKING INDUSTRY SANITATION STANDARDS COMMITTEE

STANDARD NO. 3
for
MECHANICAL INTERMEDIATE PROOFERS

Revised June 1, 1967

The requirements of this standard apply to the design, construction, and installation of mechanical dough proofers.

This standard as revised, shall become effective on and after June 1, 1967.

The General Principles of Design and Construction (pages 7 through 9) all equipment covered in this standard and shall be considered as a part of this standard except where specifically exempt. Special or Specific Requirements for equipment covered in this standard follows, and shall also be considered as a part of this standard.

4. SPECIAL PRINCIPLES OF DESIGN AND CONSTRUCTION, DEFINITIONS AND INSTALLATION OF EQUIPMENT OR MACHINERY COVERED BY THIS STANDARD

4.1 Definitions

4.1.1 Proofing. Proofing is that operation and where the dough pieces, after fermentation and/or dividing into suitably sized sections are allowed to "rest" and regain the proper dough condition for moulding or other make-up in the baking process.

4.1.2 Proofer. The proofer is that enclosure, cabinet, machine or device in which dough pieces are allowed to regain their proper condition for make-up, and includes all belts, trays, housing, structural supports, motors, chains, and loading, driving and discharge mechanisms used to accomplish the proofing process.

4.2 Specific Design Requirements

4.2.1 All proofer frame and frame support members shall be located outside the housing.

4.2.2 The proofer housing shall not contain glass panels. Any transparent material used for in-inspection ports or panels within, or adjacent to, the product zone shall be constructed to eliminate horizontal ledges.

4.2.3 All access panels on the sides or ends of the proofer housing shall be hinged at the side, or be readily removable. Such panels within, or adjacent to, the product zone shall be free from grooves in which flour and dust may collect.

4.2.4 No hollow exterior trim shall be used.

4.2.5 Base of the proofer unit, except for vertical support members, shall have a minimum clearance of six inches above the floor.

4.2.6 Catch pans under any section of the proofer shall be readily removable and shall not rest directly on the floor.

4.2.7 Top of proofer housing shall be so designed that flour or dust cannot sift down into the product zone or mechanism.

4.2.8 Trays shall be readily removable.

4.2.9 Fabric linings for trays shall be readily removable and shall be capable of being laundered. 3.1.1 and 3.1.4 Modified)

4.2.10 Trays shall not be hollow.

4.2.11 All conveyor belts shall be removable for cleaning.

4.2.12 Belts shall be supported by rods or rollers with bearings outside of product zone.

4.2.13 Proofer sprockets, chains and other mechanisms shall be readily accessible and shall be so constructed and located that lubricant cannot leak, drip or be forced into the product zone.

4.2.14 Discharge conveyor housings shall be removable or shall have access openings.

4.2.15 Electric motors shall conform to the requirements of BISSC Standard for Electric Motors, No. 29.

4.3 Installation

4.3.1 Sides and ends of proofer shall have sufficient clearance for the full opening of all hinged panels, and in no case less than 18 inches.

4.3.2 Proofer shall have a minimum overhead clearance of at least 6″ from the ceiling or from overhead beams running parallel or approxi-

mately so (not to exceed an angle of 30) with it. Where beams cross at an angle of more than 30, and providing they are no wider than 11", a minimum of 2" is permissible. Installation shall be made so that all spaces and surfaces created by the proofer top shall be accessible.

4.3.3 All joints created during erection shall be sealed.

4.3.4 The vertical support members, unless they are the sanitary type, shall be sealed to the floor.

4.3.5 Motors should be mounted on the equipment and off the floor.

TASK COMMITTEE:

LELAND MOSS, *Chairman*
CARL STEINHAUER
VINCENT T. FOLEY
LOUIS A. KING, JR.

FOOD AND DRUG ADMINISTRATION

(Continued from Page 250)

Sanitary Landfill—Design and Operation (670)—Cincinnati, Ohio, Oct. 13-17, 1969.
Elements of Solid Waste Management (655)—Cincinnati, Ohio, Nov. 17-21, 1969.
Composting Methods (680). (Location to be announced.)—Cincinnati, Ohio, Dec. 1-3, 1969.
Sanitary Landfill—Design and Operation (670)—Cincinnati, Ohio., Jan. 12-16, 1970.
Elements of Solid Waste Management (655)—Cincinnati, Ohio, Jan. 26-30, 1970.
Incineration—Design and Operation (675)—Cincinnati, Ohio, March 2-6, 1970.
Sanitary Landfill—Design and Operation 670)(—Cincinnati, Ohio, March 30-April 3, 1970.
Elements of Solid Waste Management (655)—Cincinnati, Ohio, May 4-8, 1970.
Solid Waste Handling—Health and Safety (660)—To be announced.
Solid Waste Handling—Field Evaluation (665)—To be announced.
Solid Waste Handling—Operations Management (666)—To be announced.

Special Training Branch

Bioclimatology Seminar (760)—Cincinnati, Ohio, July 14-17, 1969.
Statistical Method Evaluation and Quality Control for the Laboratory (851)—Cincinnati, Ohio, August 25-29, 1969.
Basic Environmental Statistics (801)—Cincinnati, Ohio, Oct. 6-10, 1969.
Environmental Statistics—Design of Experiment (802)—Cincinnati, Ohio, Dec. 8-12, 1969.
Statistical Method—Evaluation and Quality Control for the Laboratory (851)—Cincinnati, Ohio, January 5-9, 1970.
Environmental Statistics—Nonparametric (804)—Cincinnati, Ohio, Feb. 2-6, 1970.
Environmental Statistics—Analyzing Qualitative Data (806)—Cincinnati, Ohio, Apr. 13-17, 1970.
Comprehensive Health Planning (700)—Cincinnati, Ohio, May 4-8, 1970.
Environmental Program Management (701)—Cincinnati, Ohio, May 18-22, 1970.
Environmental Statistics—Applied Regression Analysis (810)—Cincinnati, Ohio, June 8-12, 1970.

Water Hygiene Branch

Unit Processes—Water Plant Operation (158)—Cincinnati, Ohio, Aug. 25-29, 1969.
Methods and Practices for Water Laboratory Survey Officials (142)—Cincinnati, Ohio, Jan. 26-30, 1970.
Chemical Examination of Drinking Water (141)—Cincinnati, Ohio, Mar. 23-27, 1970.
Bacterial Analysis of Drinking Water—Cincinnati, Ohio, June 1-5, 1970.

Occupational Safety and Health Branch

Workshop for Occuptional Health Nurse Consultants (537)—Cincinnati, Ohio, Aug. 4-8, 1969.
Industrial Hygiene Engineering (501)—Cincinnati, Ohio, Aug. 11-22, 1969.
Statistical Method-Evaluation and Quality Control for the Laboratory (851)—Cincinnati, Ohio, Aug. 25-29, 1969.
Air Sampling in the Occupational Environment (548)—Cincinnati, Ohio, Sept. 8-12, 1969.
Nursing Practices and Occupational Mental Health (532) (1st session)—Field, Sept. 8-12, 1969.
Industrial Hygiene Engineering (501)—Sept. 29-Oct. 10, 1969.
Workshop for Nurses in Technical School and Job Training Centers on Occupational Health and Safety (538)—Cincinnati, Ohio, Oct. 13-17, 1969.
Fundamentals of Occupational Health Nursing Practices for Nurses in Industry (534) (1st session)—Indianapolis, Indiana, Oct. 20-24, 1969.
Evaluation of Laser Hazards (545)—Field, October 27-31, 1969.
Nursing Practices and Occupational Mental Health (532) (2nd session)—Field, Nov. 12-14, 1969.
Safety in the Laboratory (480)—Cincinnati, Ohio, Nov. 17-21, 1969.
Electromagnetic Spectrum (521)—Cincinnati, Ohio, Nov. 17-21, 1969.
Industrial Hygiene Engineering (501)—Cincinnati, Ohio, Dec. 1-12, 1969.
Fundamentals of Occupational Health Nursing Practices for Nurses in Industry (534) (2nd session)—Indianapolis, Indiana, Dec. 8-10, 1969.
Industrial Noise Control (507)—Cincinnati, Ohio, Jan. 12-16, 1970.
Nursing Practices and Occupational Mental Health (532) (1st session)—Field, Jan. 12-16, 1970.

(Continued on Page 258)

RECENT DEVELOPMENTS IN RESIDUAL INSECTICIDES[1, 2]

PERRY FISHER
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ABSTRACT

Pesticides have vastly improved life for the developed nations of the world. Some developing nations lose a tremendous amount of their limited food production between harvest and consumer. It has been estimated that almost one-half of India's food production is destroyed by pests after harvest. This is a tragic loss in a nation where starvation and malnutrition are man's constant companions. Modern chemicals and pest control methods could reduce this loss in a short time. Research has continued to provide new insecticides as fast as insects have developed resistance. Unfortunately many insects have been able to develop a cross resistance to some pesticides. In other words, instead of only being resistant to malathion, diazinon, and other organic phosphates, some insects have also exhibited resistance to carbamate materials. At present no one has the answer to this resistance problem, but many people are working on it and it is not inconceivable that a solution will be found. In spite of resistance, residue tolerances, and increasing governmental restrictions, pesticides are still necessary to maintain our standards of sanitation. As regulations increase, the cost of developing new pesticides increases and the number of new compounds reaching the commercial market decreases. This decrease has been quite apparent in the past few years. If the present trend continues, it is conceivable that one day the flow of new materials will be dangerously low. At that time new approaches to replace residuals and other pesticides will be vitally important.

The new chemicals, equipment, and techniques discussed will only be useful to the food industry if they are applied. Now is the time for all good sanitarians to come to the aid of their company and their country. Increasing costs, rising purity standards, and tightening regulations will tax the managerial and technical abilities of the food industry. Our sanitation programs must be constantly ahead of requirements. Food processors cannot complacently say, "we meet specifications," because the "specifications" continually evolve toward purer food and more sanitary processing facilities.

In man's battle with insects many potions and recipes have been tried. Probably the oldest recorded use of insecticides was Homer's mention of sulfur 1,000 years before Christ. Down through the years asphalt, lime, fish oil, turpentine, spices, and many foul smelling concoctions were recommended to kill or repel insects *(11)*. It appears that one of the first requirements of insecticidal materials was an offensive odor. (Judging from the essence of some of our modern insecticides, this may still be a requirement).

[1]Presented at the 55th Annual Meeting of the International Association of Milk, Food, and Environmental Sanitarians, Inc., St. Louis, Mo., August 18-22, 1968.

[2]Readers should check current U. S. Department of Agriculture registration before using any pesticides.

By the 1600's arsenicals were being used and through the years man used many compounds such as Paris Green and bordeaux mixture, lime, and many other inorganics. One of the most widely used inorganic residual insecticides was sodium flouride roach powder, which is still employed today. Another inorganic compound which is currently receiving renewed interest is boric acid.

The natural organic insecticides or botanicals apparently were first used by the ancient Chinese. Tobacco preparations were used in Europe in the 1600's. Pyrethrum reportedly was commercially manufactured in the early 1800's, though it is difficult to determine exactly when it came into use as an insecticide *(7)*. Derris, ryania, hellebore and other plant materials have been utilized as insecticides through the years.

Synthetic organic insecticides such as carbon disulfide and paradichlorobenzene came into use as fumigants *(10)*. Between World Wars I and II much research was done on synthetic organic insecticides leading to the introduction of DDT in the early 1940's. Shortly after World War II the organic phosphates were introduced and man at last had a veritable treasurehouse of chemicals to combat the pests which constantly competed for his food and in fact for his very life.

Today these pesticidal chemicals, the miracles of ages past, are coming under ever increasing attack. Important people in many walks of life are calling for use of fewer pesticides and some even are calling for elimination of all pesticides. On the other side of the coin we see predictions of worldwide famine in the next few years. The need for more food is expounded from all quarters. Pesticides are one way of increasing the world food supply. It has been estimated that a minimum of 20 to 30% of the world's food production is eaten or destroyed by insects and other pests *(6)*. In addition, diseases carried by insects have killed more people than all the wars since the beginning of time. DDT, alone, is credited with saving 5 million lives during and immediately after World War II *(2)*. Thus, it can be seen that there is great need for continued research and development of pesticides.

PROMISING EXPERIMENTAL INSECTICIDES

At present there are quite a number of promising

experimental insecticides in various stages of development. These materials are not yet on the market and, judging from past history of experimental materials, some of them probably will not be marketed for one reason or another. Geigy has a compound, GS13798, which is fast acting, has given good control of cockroaches, and has a good residual life. It has a toxicity level similar to diazinon or slightly safer. (Toxicity refers to acute oral toxicity in rats unless otherwise defined here.) Chemagro has an experimental compound BAY 77488, an organic phosphate, which has shown good kill of cockroaches, stored product insects such as confused flour beetles and cigarette beetles, mosquitos and houseflies, and many crop insects. As a spray for stored grain it has been comparable to malathion. BAY 77488 has an LD_{50} similar to malathion and ronnel. It looks like this material has promise in this field of insect control. Another Chemagro compound, BAY 78182, is also an organic phosphate. It has provided good control of stored product insects, mosquitos and flies, but its activity against roaches has been less promising. The toxicity level is similar to BAY 77488.

Dow has an organic phosphate, Dursban, which has shown good results on stored products insects, cockroaches, and other pests. As a residual in comparison with diazinon it has given superior control of cockroaches in 75% of a reported series of tests *(12)*. Dursban's toxicity is in the range of diazinon's.

In addition Dursban with dichlorvos or synergized pyrethrins gives rapid knockdown of roaches. CIBA has a promising insecticide, C 8354 which has given good residual action on roaches. Many companies have promising residuals in various stages of development.

Remember, the foregoing materials are not registered for use in food plants. It is a long rocky road from the chemist's synthesis of a new insecticide to spraying in your food plant. The amount of insecticides used in the food processing and storage industry is very small in comparison to the amount used in agriculture. One farmer probably uses more insecticide annually than many of the national food chains. So, when the economics of this market are considered, there just isn't much incentive for the insecticide producers to go to the added expense and testing required to register residuals for use in the food industry. Registration is quite often left to the food industry and/or to their suppliers. In one instance, it took over a year for a manufacturer to decide that he would sell a technical insecticide to a formulator. Then there was the U. S. Department of Agriculture registration still to be accomplished. One to 2 years are sometimes required to take a commercially available insecticide from the laboratory testing stage to the point where it can be used in the food plant.

RECENT DEVELOPMENTS IN REGISTERED RESIDUAL INSECTICIDES

One of the first successful carbamate insecticides was carbaryl. It has been in use in agriculture for about 10 years with good results on a wide variety of pests. Carbaryl is approved for use in homes, hotels, restaurants, food handling plants, farm buildings (except dairy barns), recreation areas, and on pets and livestock. Most carbamate insecticides are more difficult to formulate than other materials such as phosphates. For this reason carbaryl is quite often used as a dust. It is commonly used in combination spray dust treatment with phosphates such as diazinon or fenthion. This combination is extremely effective for heavy roach infestations. In addition to cockroaches, carbaryl is effective for ants, earwigs, millipedes, ticks, fleas, and mosquitoes. The acute oral toxicity of carbaryl is 600 which is about midway between diazinon and malathion.

Dimethoate is an organic phosphate compound that is receiving a good bit of attention for residual fly control. It is labeled for use in and around federally inspected meat packing plants, except where food products are processed or handled, for residual fly control in farm buildings, outside food plants, homes, warehouses, loading docks, and refuse areas. The long residual action of dimethoate appeals to users. It is claimed that 2 to 3 dimethoate treatments will last the entire season. In field tests of residual action dimethoate was superior to naled, ronnel, diazinon, and malathion *(1)*. Considerable savings in labor cost can be realized with a long residual material such as this. The toxicity of dimethoate is around 200 which is safer than diazinon.

A popular carbamate insecticide is Baygon. The pest control industry has used it extensively for cockroach control. Recently a ready-to-use oil base formulation was registered for use in food plants and it is now available. Baygon has a unique combination of properties. It has excellent flushing action to drive insects from harborages, rapid knock-down action, and long residual action. In addition to roaches; stored product insects, including both moths and beetles; mosquitoes; flies; ticks; ants; spiders; and others are controlled with Baygon. In mosquito control, a combination of Baygon and Baytex appears to be synergistic giving much better results than either insecticide alone. Baits for cockroach control using Baygon as the toxicant have been very successful. Fly baits with Baygon kill flies within a few seconds. Both baits are very stable. There have been some difficulties with staining in pest control

operations using Baygon. Alkaline surfaces such as fresh concrete or whitewash tend to reduce the stability of Baygon residues. Also there seems to be some cross resistance to Baygon when used on phosphate resistant species. Baygon is just slightly more toxic than diazinon.

Dichlorvos, an organic phosphate, is another established chemical for which new uses are constantly being discovered. It is one of the few insecticides that are recommended for both residual and contact use in homes, food plants, industrial plants, theaters, and warehouses. It is approved for control of flies, mosquitoes, wasps, gnats, cockroaches, ants, spiders, and silverfish. Control of cigarette beetles in tobacco warehouses with timed applications of dichlorvos aerosols has been a boon to the tobacco industry. Fumigation with hydrogen cyanide once or twice per year does not give satisfactory control of tobacco pests. A combination treatment of fumigation of new crop tobacco followed by daily application of dichlorvos aerosol controls pests and prevents reinfestation. The automatic dispensing system provides exacting control with reduced labor costs *(3)*. A similar use of dichlorvos has reduced *Drosophila* populations in wineries *(13)*. In effect the timed release of dichlorvos has maintained a residual of vapors in the air. The same goal is achieved with the familiar fly strips you see so often. International airlines are using dichlorvos to kill any insect stowaways on flights between countries. As a normal residual deposit, dichlorvos is short lived but it has excellent knock-down properties. Generally it is used in combination with more stable residual materials. The toxicity of dichlorvos is below 100, making it more toxic than diazinon or Baygon.

Another compound that recently was made available for use in food plants is fenthion. It is an organic phosphate which has been in use for some time, but restricted labeling has kept it out of food plant use. As originally labeled it could be used only by pest control operators. It is now labeled for use by trained operators such as food plants require for the application of any insecticide. Fenthion is approved for use in homes, food processing plants, in inedible product areas of federally inspected meat and poultry plants, and in similar applications. It controls cockroaches; crickets; fleas; flies; mosquitoes; and stored product insects such as confused flour beetles, sawtoothed grain beetles, and moths *(5)*. One unique property of fenthion is its stability on alkaline surfaces. It can be applied to fresh whitewash without appreciable reduction of its residual action. This is indeed rare, most insecticides are not stable as residuals in alkaline conditions. For this reason fenthion is widely used as a residual in exterior fly control and in mosquito control. A material having such a broad spectrum of activity as fenthion is ideal for food plant use because a single treatment controls practically any insect likely to be found. Also the relatively safe toxicity of fenthion, approximately twice that of diazinon is another plus for food plant use.

Recent Developments in Residual Insecticide Application

One of the problems in applying residuals is the human element. Operators can use the wrong insecticide, apply too much or too little, not apply it thoroughly, or abuse the procedures in many ways. This could only increase the annual insecticide bill, or it could injure the operator or some other plant employee, or it could result in product contamination by insecticide or insects. Contamination could cause the loss of a customer, the recall of substantial amount of product, or action by regulatory agencies. No business wants any of these possibilities. So there is a good bit of work being done to reduce the possibility or prevent these accidents.

Automatic aerosol dispensers are widely used for contact insecticides. A dispenser of this type usually consists of a timed valve and an aerosol reservoir. Dispensers are available in battery powered or line operated models. Many applications employ synergized pyrethrins, which, depending upon the local health department, are acceptable for use in homes, restaurants, food plants, etc. The product must be used strictly according to the manufacturer's directions, normally one unit per 6,000 ft^3. In addition it is usually required that the dispenser be located at least 8 ft from exposed food or product contact surfaces of equipment. If one thinks of residual insect control with an open mind, it can be seen that this type of device has possibilities as a residual. Though it might not be applying a chemical residue to a surface, a dispenser is applying a residue, (if you will) in the air. Think now of areas that are often skipped in residual insecticide application, areas such as elevator pits, crawl spaces under buildings, utility ducts, and similar places. An automatic dispenser will give continuous control in such areas and eliminate the tendency of operators to skip them. The dichlorvos dispenser in tobacco warehouses discussed previously is an example of this type of control. As in all sanitation procedures, the purity of the food product must be protected, so do not use automatic dispensers in any way whereby contamination could occur.

Another aerosol insecticide concept that is available is the total release aerosol. This is simply an aerosol container with a valve that can be locked open to spray the entire charge in one treatment.

Although its use must be carefully supervised, it has a place in food industry pest control. Advantages of this type of treatment include small labor cost, total coverage, improved penetration of cracks and crevices, and combination of contact and residual action. Disadvantages would include higher cost of insecticide, residues on all exposed surfaces, and required evacuation of treated area for probably a minimum of 2 hr. Many different formulations are available, usually combining a standard residual such as Baygon with dichlorvos. This is an ideal treatment for rail cars and other vehicles which must be treated before loading food products. This is indeed a thorough, easy means of applying residual insecticides which is being used more and more.

Vapona resin strips, commonly known as fly strips are widely used in homes, restaurants, etc. They embody dichlorvos in a plastic material. Although these strips are certainly not new, new applications for them are continually coming forth. One recent use is for residual fly control in latrines such as are found in summer camps and military posts *(8)*. Another unique use is as residual fumigants (if we can take this much freedom with terminology) in sumps, crawl spaces, and attics; areas which need protection, but are difficult to treat with ordinary residual insecticides. Although they may not maintain a high enough concentration to kill all insects, they normally will prevent insects' living in such areas. Another area where fly strips can be of great use is in dumpster and similar trash bins. If the lids are even partially closed, dichlorvos vapors do an excellent job of repelling flies and other pests. The label registration for Vapona strips covers homes, motels, restaurants, and farm buildings including dairy barns. From available data, fly strips appear to be very safe when used as directed, even when abused. Acceptability in commercial establishments depends upon the local health authorities; the Public Health Service approves their use according to directions, provided they are not positioned directly over exposed food or food contact surfaces.

Central sprayer systems have been used for contact insecticides for many years. Normally these systems consist of an insecticide reservoir, piping, nozzles and steam or air pressure to atomize the insecticide. Recently a new system has been marketed with a patented nozzle and an electric motor powered pump. Some of the advantages claimed for this system include: water based insecticide, electric timer to set for desired frequency of application, and constant pressure in the system so that all nozzles open at the same time. A system of this type would be good for some of the residual applications mentioned previously. If proper insecticides were used, this central system could be employed for automatic pest control in warehouses and similar situations.

There is some work being done in parlor type hog barns where an emulsifiable insecticide is injected into an overhead sprinkler system. As the sprinkler system operates to keep the hogs cool, it also sprays periodically. The only mechanical alteration involved in the sprinkler system is the addition of an insecticide reservoir and a timed valve to divert the sprinkler water through the insecticide system. Dichlorvos has given good fly control in this application. A system of this type holds promise for treating areas outside food plants such as loading docks, refuse and garbage areas, and areas which need regular treatment for fly and other insect control.

There is at least one sprayer on the market that can be used for both contact and residual application. It is a pressurized tank with atomizing nozzles and hose for applying residual. The tank is pressurized with compressed air and the sprayer can then be rolled about for mist spraying or residual spraying. If desired, up to 300 ft of hose can be used for residual spraying.

Another unique bit of research in residual insect control has been done by the USDA. In this work horn flies were controlled with a fast acting residual insecticide which was not applied to cows or buildings. Flies were killed by small squares of muslin cloth upon which the insecticide residue was deposited. As the cows moved into the barn for the early morning milking, they traveled through a narrow lane. One 18 inch long ultraviolet light was positioned on each side of the lane. The treated muslin cloth was placed over each light and as flies were attracted to the light, the residual on the cloth eradicated them. After 3 days of control, milk production was up an average of 1 lb per day per cow. Complete control was reached in about 3 weeks. This illustrates some of the possibilities for using insecticides without residue problems and manual spraying *(9)*.

Insecticide baits have a place in residual insect control programs. There are instances where neither contact nor residual insecticides can be used. Zoos, aquaria, and laboratories sometimes require insect control. In many instances, treatment in the usual fashion would damage valuable animals or interfere with research projects. Hence, baits are the method of choice for such restricted areas. Ants and cockroaches are commonly controlled with baits, as are houseflies. Most baits utilize insecticides such as Baygon, Kepone, or the organic phosphates. Dichlorvos is an excellent fly bait toxicant. With careful use baits can add to a food plant's pest control program and reduce the amount of spraying required.

OLDER PEST CONTROL METHODS ARE BEING RECONSIDERED

One of the old inorganic insecticides, boric acid, is receiving fresh attention for cockroach control. It was used extensively during and before World War II, but was generally replaced by the synthetic organics. In a series of tests on the West Coast boric acid dust gave better control of German roaches than diazinon, Baygon, or diazinon plus dichlorvos. This trend held true in laboratory test, in residences and in commercial buildings. Boric acid gave excellent residual action. Superior control was achieved with boric acid especially in residences which were in poor physical condition and cluttered. It was illustrated that many contemporary insecticides are highly repellent to the German roach. Boric acid is much less repulsive to roaches, so therefore they continue to pass over residues rather than avoid them. It was reported also that boric acid tended to kill roaches in the treated area rather than drive them to untreated areas as do normal organic insecticides *(4)*.

Insecticidal lacquers are being investigated for residual use. In England they have met with a good deal of success. Tests in this country have been less promising. There are applications where these materials would be well received if the residual action was appreciably better than oil or water base sprays.

EXOTIC CONTROL METHODS

One of the most publicized new insect control techniques is the sterile male release method. This method has eliminated the screwworm from the Southeast, has drastically reduced it in the Southwest, and earned a place in history. For certain outdoor uses where insect populations retreat onto a peninsula as the screwworm did during the winter in the Southeast or where similar natural barriers exist, sterile male release has possibilities. Another requirement is that females mate only once, and preferably that males mate more than once. Also the insect should be easily reared and sterility should not reduce mating vigor. As you can see there are many requirements for sterile male release insect control. Probably very few of these exist in food plants, and who is going to release more insects into their plant?

Insect predators have done excellent jobs of insect control. The Australian ladybeetle successfully controlled cottony cushion scale in California. Many farmers buy ladybeetles and other predators to control crops pests. But, alas, the food industry is not likely to receive much help from insect predators. Regulatory agencies would probably consider a lady beetle in your product as a contaminant, not a predator. Bird and rodent predators are forbidden. It appears that insect predators hold little promise to the food processing industry.

Bacillus thüringiensis is an innocent sounding bacterium which has been successful in controlling certain insect pests in the orders *Lepidoptera* and *Diptera*. This bacterium has been in commercial production for a few years and has been used on a number of agricultural pests, principally lepidopterous larvae. At present there are no claims for this or other insect pathogens to successfully control stored products insects or other pests of the food processing industry. With the current federal emphasis on bacteria counts of food products, it appears unlikely that anyone will recommend addition of bacteria to the food plant.

Birth control pills have received great publicity and it appears the world is divided, some for, some against their use. Insects too, have various birth control chemicals, these are known as chemosterilants. Everyone, except the insects, seems in favor of their use. Chemical sterilants accomplish the same purpose as the sterile male release technique. The main difference being that usually chemosterilants are applied to the natural population and sterile males are reared artificially and sterilized by radiation or chemosterilants. Insect populations that mix extensively before mating are ideal targets because a limited number of chemically sterilized insects will be spread through the population. Species which remain near the site of emergence, as stored product insects do, would not be good targets because chemical sterilization would be inefficient. Also, chemosterilants are a slow way of controlling insect populations because the treated insects live on and their progeny are prevented. This approach is not acceptable in an industry where purity of foods must be maintained at all costs. Conventional insecticides are more practical than chemosterilants for food industry use.

A recent innovation in public health and agricultural pest control is the ultra-low volume, (ULV) method of applying insecticides. This approach is simply the substitution of an insecticide concentrate, such as is used in preparing water or oil base sprays, for the water or oil diluted spray. In aerial application, planes can cover much more area with ULV than conventional sprays because reloading is drastically reduced. Many insecticides work just as well this way as they do diluted. The secret is in getting the proper coverage of the treated area. For many years this is what the food industry has been trying to do, get the proper coverage with the least possible amount of spray. The ULV method is not likely to be used in food plant sanitation unless it is for treating the exterior grounds or some similar application. ULV is not, at present, suited for interior pest control.

Attractants have been discovered for many species

of insects. Some are sex attractants, in that they produce a mating response in the insect, others are feeding attractants, which as the name implies, elicit a feeding response. A third type of attractant, the oviposition attractant causes the insect to lay eggs. Sex attractants have been isolated for a few insects including the American cockroach. A control technique whereby males are attracted to a poisoned bait has been very successful on some of the fruit flies. Attractants are also very useful in insect survey work such as monitoring mosquito populations and policing border areas to detect quarantined pests. Work continues on isolating additional attractants and making better use of existing ones. If an attractant could be utilized in a food plant to draw all members of an insect species into a trap or to a toxic bait, many of the problems discussed here would be solved. No longer would it be necessary to lay down residual deposits to control that insect species. In this regard the future looks bright, more attractants are on the way.

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FOOD AND DRUG ADMINISTRATION

(Continued from Page 252)

Recognition, Evaluation, and Control of Occupational Hazards (549)—Cincinnati, Ohio, Jan. 19-23, 1970.

Industrial Hygiene Chemistry (502)—Cincinnati, Ohio, Jan. 26-30, 1970.

Nursing Practices and Occupational Health (531 (1st session) —Cincinnati, Ohio, Feb. 16-20, 1970.

Industrial Hygiene Engineering (501)—Cincinnati, Ohio, March 2-13, 1970.

Evaluation of Laser Hazards (545)—Cincinnati, Ohio, March 16-20, 1970.

Safety in the Laboratory (480)—Cincinnati, Ohio, March 30-April 3, 1970.

Nursing Practices and Occupational Mental Health (532) (2nd session)—Field, April 1-3, 1970.

Industrial Hygiene Engineering (501)—Cincinnati, Ohio, Apr. 27-May 8, 1970.

Nursing Practices and Occupational Health (531) 2nd session)—Cincinnati, Ohio, May 4-6, 1970.

Orientation in Occupational Health (509)—to be announced.

Electromagnetic Spectrum (521)—to be announced.

Evaluation of Laser Hazards (545)—to be announced.

Industrial Hygiene in the School Workshop (591)—to be announced.

RECOVERY OF *STREPTOCOCCUS AGALACTIAE* FROM A HERD OF LOW PREVALENCE OF INFECTION: A METHOD OF SURVEILLANCE AFTER ELIMINATION OF INFECTION[1, 2, 3]

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Abstract

Three sources of inoculum were examined using TKT medium for detection of *Streptococcus agalactiae* from a herd of low prevalence of infection. An inoculum of a loopful (0.01 ml) from a bulk milk sample yielded a 3.6% recovery rate. An inoculum of gravity cream from bulk tank samples yielded a 36.5% recovery rate. In a third technique, a loopful of rinsings from the filter pad, through which a complete milking had been filtered, yielded a 62.0% recovery rate.

Minett et al. *(3)* demonstrated as early as 1933 that *Streptococcus agalactiae* could be eliminated from individual dairy herds and that herds could be maintained free from infection. Postle *(5)* demonstrated the efficiency of a selective and differential medium (TKT medium) for identifying CAMP test positive streptococci from pooled herd milk. It was shown that more than 5% of quarters must shed S. *agalactiae* in order to permit isolation of these organisms on TKT medium from a single bulk sample.

A method of surveillance after elimination of infection from a herd would be useful in an eradication program. Infection can be reintroduced into the herd from heifers with latent infections *(6)*, by dry cows not examined during the period of elimination *(2)*, or by purchase of infected animals. In the investigations described in this report attempts were made to detect S. *agalactiae* from pooled milk and herd filter pads from a herd of low prevalence of infection.

Materials and Methods

Source of samples. Bulk milk samples and filter pads were collected from an experimental herd in which approximately 40 lactating cows were maintained. After having eliminated S. *agalactiae* from the herd, one quarter of one cow was intentionally reinfected with S. *agalactiae*. This animal was milked last.

Sources of inoculum. Three sources of inoculum for culture were examined. *(a)* A loopful (0.01 ml) of milk from a well mixed 2 oz sample was inoculated onto TKT medium *(5)*. *(b)* Gravity cream *(1)* (12-24 hr standing) from a 2 oz sample was inoculated onto TKT medium with a sterile cotton swab. *(c)* The filter pad that was used during that milking was rinsed with 30 ml of saline solution, and a loopful (0.01 ml) of the rinsing was inoculated onto TKT medium. These methods were examined using samples from 137 milkings.

Table 1. Recovery of streptococcus agalactiae from a herd of low prevalence of infection[1]

Inoculum	Isolation of S. *agalactiae*	
	n	%
0.01 ml loop from 2 oz bulk samples	5	3.6
12-24 hr gravity cream from 2 oz bulk sample	50	36.5
0.01 ml loop from 30 ml saline rinse from herd filter pad	85	62.0

[1]137 trials were performed using each method.

All colonies that were hemolytic on TKT medium were presumed to be S. *agalactiae* or *Streptococcus uberis*.. In order to differentiate S. *agalactiae* from CAMP-test S. *uberis* all colonies hemolytic on TKT medium were transferred to esculin-ferric citrate blood agar *(4)* to determine CAMP test reactions and ability to hydrolyze esculin.

Results

Results comparing the efficiency of three sources of inoculum for identification of S. *agalactiae* from a herd of low prevalence of infection are presented in Table 1. Rate of recovery was highest (62.0%) using the filter pad method, the gravity cream method yielded S. *agalactiae* from 36.5% of the samples, and the recovery rate was lowest (3.6%) when a loopful (0.01 ml) of bulk milk was used.

A probability chart (Table 2) was developed for the gravity cream and filter pad methods of recovery. This shows the number of consecutive negative cultures needed to indicate with any given probability that a herd of 40 cows would be free of S. *agalactiae* infection. For example, with a herd of this size, if

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[3]The authors wish to thank Miss Karen Mandt for assistance in the laboratory.

TABLE 2. PROBABILITY TABLE[1]

P	Number of negative tests									
	1	2	3	4	5	6	7	8	9	10
Cream swab	.36	.60	.75	.84	.90	.94	.96	.975	.986	.99
Filter pad	.62	.85	.95	.98	.99					

[1]Note: $\underline{P} = 1 - q^{n}$ when
$\underline{P}$ = probability that there is no S. *agalactiae* infection in a herd of 40 cows.
q = percentage of negative tests on 137 trial cultures.

the cream swab method were performed on 10 consecutive samples with negative results, there would be a 99% certainty that none of the animals would be infected with S. *agalactiae*. For comparable assurrance with the filter pad method, only five consecutive negative tests would be required.

DISCUSSION

The efficiency of TKT medium for identification of S. *agalactiae* in bulk milk samples from a herd of low prevalence of infection is apparent. Culturing only a single loopful of the bulk milk resulted in too few recoveries (3.6%) to be useful as a screening method in such herds, whereas cream swabs or filter pad rinses as culture inoculum were adequate for this purpose. The filter pad technique was the more sensitive, with a recovery rate of 62%. It should be pointed out that the cow which had S. *agalactiae* infection in one quarter was placed last in the milking order in order to reduce the possibility of spread of the infection throughout the herd. Since this milk was filtered last, it might have favored recovery by the method using filter pads. It would be necessary to repeat the study with random order milking to establish this point.

In an attempt to obtain data from the field for this investigation, several farmers were asked to supply filter pads which had been used in the previous milking. Less than half were willing to cooperate. The reluctance encountered in this initial survey would probably be found to an even greater extent in an official program.

The cream swab method is effective when used repeatedly. It requires no special samples other than a bulk sample. This would provide a surveillance system to detect exacerbation of latent infections or reintroduction of infection in herds from which S. *agalactiae* infection had recently been eliminated. The probability chart (Table 2) gives an indication of the number of samples that must be examined.

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SOURCES AND MECHANISM OF CATALASE ACTIVITY IN THE CATALASE TEST FOR ABNORMAL MILK[1]

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Abstract

Catalase scores of fat and cell-free milk were 25 ± 9% of the total catalase scores of whole milk. Relatively more free catalase was present in mastitic than in normal milk. Addition of H_2O_2 caused death and disintegration of leucocytes and addition of surfactants increased the rate of death of leucocytes and rate of O_2 release from H_2O_2. Disruption of milk leucocytes by insonation released catalase without appreciable loss of activity. From these results it was concluded that, in the catalase test the H_2O_2 caused death and disintegration of leucocytes, thus liberating catalase which released O_2 from H_2O_2. Enzyme activity of beef liver catalase was greater in the presence of heat-labile whey proteins of milk than in buffer. Presence of more than 2 x 10^5/ml of high catalase producing bacteria in milk contributed significantly to the catalase score of the sample.

Although the amount of catalase is known to be increased in milk from cows with mastitis, some poor correlations between leucocyte counts and catalase scores in milk have been reported *(1, 3, 5, 10)*. Spencer and Simon *(12)* found appreciable amounts of catalase in the cell-free fractions of normal and mastitic milk, but little is known about the quantitative distribution of catalase in cellular and cell-free fractions of normal or mastitic milk. The purpose of this report is to present results of some studies which were made to determine the sources of catalase activity in milk, including the effect of the presence of bacteria in milk on the catalase scores and the effect of certain milk constituents on the activity of beef liver catalase.

The mechanism of the catalase test on milk is inadequately understood. To obtain information on this aspect of the test, the effect of insonation, H_2O_2 and surfactants on viability of the leucocytes was studied in relation to the catalase activity of the samples.

Materials and Methods

Milks used throughout these investigations were well mixed bucket-milk samples from individual cows of the University of Wisconsin Dairy herds. All samples were tested within 4 hr after milking. The catalase test was conducted using tube method A *(9)* with 10 ml of milk, 2 ml of 3% H_2O_2, and 3 ml of water, incubated at room temperature for 3 hr with 4 replicates for each sample. Counts of total leucocytes, live and dead leucocytes were made as described elsewhere *(9)*.

Sources of catalase in milk. Portions of samples of milk from 28 cows were centrifuged at 600 x *g* for 10 min, and layers of fat removed and the skimmilk decanted. This was repeated twice for each sample to remove all of the leucocytes from the milk as determined by microscopic examination. Catalase tests were made with uncentrifuged and centrifuged preparations and the data recorded as total and free catalase, respectively.

On the basis of these tests six apparently normal cows whose whole milk had total catalase scores under 30% O_2 and six with histories of chronic mastitis and total catalase scores above 30% O_2 were selected for additional investigations. Bucket-milk samples were obtained at weekly intervals for 8 weeks and total and free catalase scores in each sample were determined.

Effect of bacteria on catalase scores of milk. Cultures of *Streptococcus agalactiae, Staphylococcus aureus, Escherichia coli,* and *Bacillus subtilis* were prepared in brain heart infusion broth (Difco) with overnight incubation at 37 C. A mixed culture of bacteria from milk, containing mainly *Pseudomonas* sp. was similarly prepared. Graded quantities of each culture were added to milk of low catalase scores and bacterial plate count *(11)* and catalase tests were performed on each sample. The significant difference in catalase scores of the same sample with and without the addition of bacteria was determined by the method of least significant difference *(13)*.

Effect of milk constituents on catalase activity. To determine the effect of milk constituents on catalase activity, six samples of milk with catalase scores varying from 4 to 36% O_2 production were divided into 8 portions each. Equal amounts of beef liver catalase were added to each of 4 replicate samples and catalase activity determined. Controls consisted of 4 replicates with equal amounts of beef liver catalase in 0.1 M phosphate buffer of pH 6.6 and 4 replicates each of the milk samples without added catalase.

In further experiments, beef liver catalase was added to phosphate buffer, skimmilk, skimmilk heated at 90 C for 10 min, and "lactalbumin" or "lactoglobulin" prepared as described by Jenness and Patton *(6)*, and catalase tests were performed on each mixture.

Effect of disruption of leucocytes on catalase activity. Portions of four milk samples with catalase scores ranging from 20 to 100% O_2 production, and suspensions of milk leucocytes in phosphate buffer were insonated[1] for 5, 10, and 15 min. Total, live and dead leucocytes, and catalase scores were de-

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TABLE 1. EFFECT OF MILK CONSTITUENTS ON THE ACTIVITY OF BEEF LIVER CATALASE

	Buffer pH 6.6	Skimmilk	Skimmilk heated 90 C for 10 min	Whey	"Lactalbumin" 0.45%	"Lactoglobulin" 0.15%
Per cent O_2 production without added catalase	0	19.5	0.5	2	0.5	1.5
Per cent O_2 production with added catalase	20	47.5	22	31	25,5	31.5
Activity of added catalase in relation to that in buffer[1]	100	140	107	145	125	150

[1]20% O_2 produced by added catalase in buffer was assumed as 100% activity of the beef liver catalase and the others were calculated as follows:

$$\frac{\left[\begin{array}{c}O_2 \text{ production AFTER addition of the catalase} - O_2 \text{ production BEFORE addition of the catalase}\end{array}\right]}{O_2 \text{ produced by the catalase in the buffer}} \times 100$$

termined before and after insonation. The samples which were insonated for 5 min were centrifuged at 800 x *g* for 10 min, fat and sediment were removed, and catalase scores determined. Total catalase scores of control samples, not subjected to insonation, were also determined.

Effect of H_2O_2 and surfactants on leucocytes and catalase activity. Six milk samples, each of which contained more than 10^6 leucocytes per ml, were centrifuged at 400 x *g* for 10 min, and the sediment was resuspended in a small volume of the original milk. The above suspension was divided into three 10 ml portions. To one portion, 2 ml of 3% H_2O_2 and 3 ml of water were added and proportions of live and dead leucocytes were determined at 0, 10, 20, 30, 40, 60, and 90 min. To the other two portions of leucocyte suspensions in milk, 2 ml of 3% H_2O_2 and 3 ml of 1:5 Mastest solution[2] or 3 ml of 0.5% sodium lauryl sulfate were added and the proportion of live and dead leucocytes was determined at 0, 10, 20, 30, 40, 50, and 60 min.

In a different experiment, milk samples from 10 cows with catalase scores ranging from 10 to 70% (mean 26%) O_2 production were divided into 12 portions of 10 ml each. The following materials were added to each set of 4 replicate milk samples: 3 ml of 1:5 Mastest solution; 3 ml 0.5% sodium lauryl sulfate; 3 ml H_2O. The catalase test was then performed on each sample by addition of 2 ml 3% H_2O_2. Oxygen released was recorded at 10, 20, 30, 40, 50, 60, 75, 90, 120, 150, and 180 min.

activity varied from 15 to 50% (mean 25 ± 9*) of the total catalase score. The correlation coefficient between free catalase scores and total catalase scores was .89 ($P < .05$). The proportion of dead leucocytes in the 28 samples ranged from 5 to 50% (mean 21 ± 12*), of the total leucocytes. The correlation coefficient between free catalase scores and log of the number of dead leucocytes was .59 ($P < .20$).

RESULTS

Sources of catalase in milk. Catalase tests conducted on each sample before and after centrifugation showed that in different samples the free catalase

The total catalase scores of milk from normal cows was less than 30% O_2 production of which 15 to 35% (mean 26) resulted from free catalase. Milk from cows with mastitis had relatively higher free catalase activity, ranging from 25 to 50% (mean 41) of the total catalase scores.

Effect of bacteria on catalase score of milk. The least significant difference in catalase scores was found to be approximately 4% O_2 production. On this basis, significant increases in catalase score occurred when more than 2 x 10^5 *B. subtilis*/ml, 1 x 10^6 *E. coli*/ml, 5 x 10^6 *S. aureus*/ml and 5 x 10^6 mixed culture/ml were present. A significant increase in catalase score was not observed in samples with as many as 5 x 10^6 *S. agalactiae*/ml.

Effect of milk constituents on catalase activity. The increase in O_2 production contributed by the added beef liver catalase in whole milk samples was 46% (range 20 to 60%) greater than the same amount of beef liver catalase in buffer.

As shown in Table 1, the activity of beef liver catalase was 40% greater in skimmilk than in buffer. This increased activity was eliminated by heating skimmilk before adding beef liver catalase. Whey buffered at pH 6.6 (after acid precipitation of casein) had a catalase enhancing effect of the same order as unheated skimmilk. This enhancing activity was associated to a greater extent with "lactoglobulin" than

[1]"Sonifier," Branson Instruments, Stanford, Conn.
[2]Norden Laboratories, Lincoln, Nebraska.
*Standard deviation.

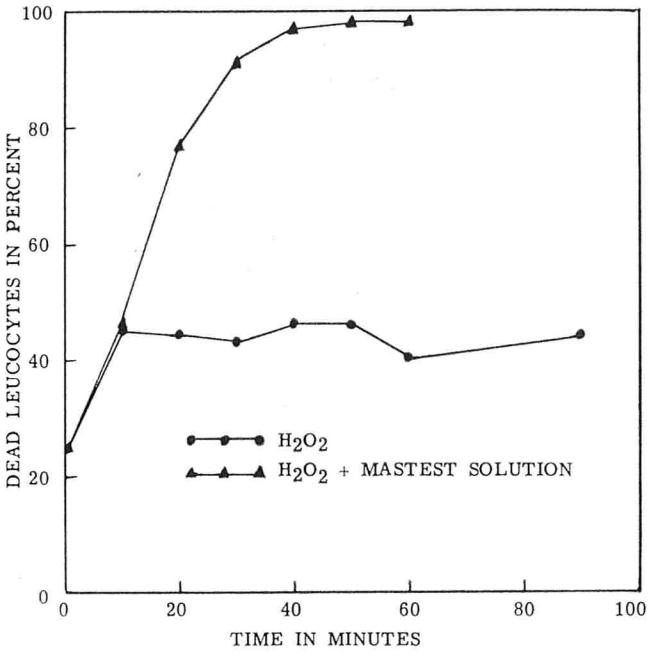

Figure 1. Effect of H_2O_2 and surfactant (Mastest solution) on leucocytes of milk.

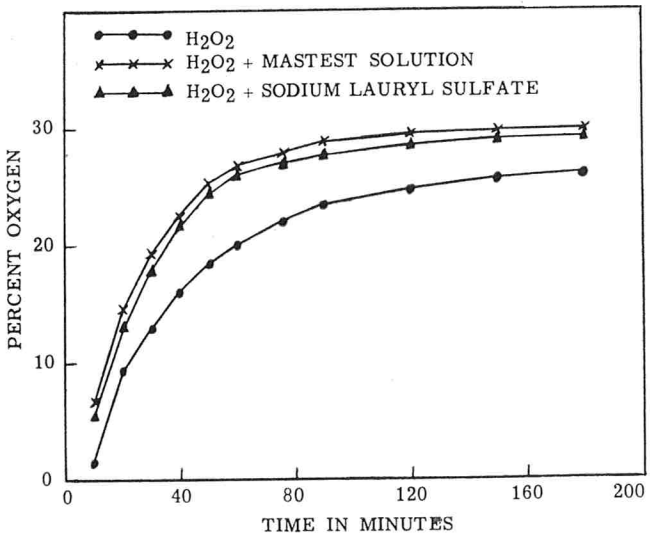

Figure 2. Effect of surfactants on the rate of release of oxygen (average of 10 different samples).

with "lactalbumin." Removal of fat, addition of Fe^{3+}, Ca^{2+}, or Mn^{+} had no significant effect on catalase activity in this system.

Effect of sonic disruption of leucocytes on catalase activity. Leucocyte counts in the samples before insonation ranged from 7.0 x 10^5 to 1.3 x 10^7 (mean 4.6 x 10^6) cells/ml of which 15 to 38% (mean 26%) were dead cells. After insonation for 5 min more than 90% of the leucocytes were disintegrated and non-stainable with methylene blue and of the stainable cells more than 90% were dead, so that less than 1% of the initial leucocytes remained alive. The catalase scores of the samples insonated for 5 min were 90 to 100% of the catalase scores of the untreated samples, and were only slightly less when insonation was extended to 15 min. The catalase scores of the insonated, centrifuged cell-free skimmilk were 90 to 95% of those of the untreated samples.

Effect of H_2O_2 and surfactants on leucocytes and catalase activity. The results are presented in Fig. 1. Proportion of dead leucocytes in the presence of H_2O_2 reached maximum of 45% in 10 min, and the remaining leucocytes appeared to be viable through the 90 min observation period. After 40 min exposure to the surfactants in the presence of H_2O_2 practically all of the leucocytes were dead. Significant differences in rates of death of leucocytes between Mastest solution treated and sodium lauryl sulfate treated samples were not observed.

In the experiment in which catalase scores were determined with and without Mastest solution or sodium lauryl sulfate, the rate of release of O_2 was faster, reaching completion in 90 min in the presence of surfactants. These results are presented in Fig. 2. A statistical comparison of catalase test scores at 90 min in samples with surfactant and 180 min in control samples was made. The correlation coefficient is .99 ($P < .01$) and the regression coefficient is 1.035 (results with surfactants being y). The standard deviations of 4 replicates were 1.9% and 2.8% O_2 production with and without surfactants, respectively.

DISCUSSION

These results confirm the findings of Spencer and Simon *(12)* that catalase may occur free in milk. Relatively greater amounts of free catalase were present in mastitic than in normal milk. The origin of this free catalase is not clear. Although the amount of free catalase was poorly correlated with the number of dead cells in the untreated milk samples, cells which had died and disintegrated in the udder before the milk samples were drawn could not be estimated. It is proposed that variations in the free catalase content of the milk of different cows may be related to variations in the rate of death and disintegration of leucocytes and perhaps parenchymal cells in the udder as part of the inflammatory process. The presence of free catalase in milk could be one of the factors responsible for the poor correlation between cell counts and catalase scores which have been reported *(1, 3, 5, 10)*.

The present experiments on the effect of bacteria on milk catalase scores are in general agreement with those of Monlux *(8)*. Even the most active catalase producing pure cultures of *B. subtilis*, significantly increased catalase scores only when populations were 2 x 10^5/ml or higher. Since the legal standard in the

United States for grade A raw milk is not more than 2 x 10^5 bacteria/ml, and for manufacturing grade raw milk is not more than 1 x 10^6 bacteria/ml, the contribution of bacteria to the catalase scores of milk is not likely to be significant unless the organisms consist entirely of high catalase producing bacteria.

Hydrogen peroxide inactivates catalase *(6)*, as it is a strong oxidizing agent which denatures proteins. The greater activity of beef liver catalase in milk, skimmilk, and whey than in buffer appear to result from stabilization of the enzyme by heat-labile whey proteins in the presence of H_2O_2. It is reasonable to assume that the natural catalase in milk is similarly stabilized. The whey protein concentration, which varies among different cows *(6)*, in the same cow at different stages of lactation *(2)*, and in mastitic cows depending on the degree of inflammation *(4, 7)*, may influence the catalase scores of milk. However, more experimentation is needed to establish the significance of whey protein concentration on catalase scores of milk.

In the presence of H_2O_2 alone the catalase reaction did not reach completion by 90 min, probably because something less than one-half of the leucocytes did not die and release their catalase. The rate of death of leucocytes in the presence of H_2O_2 alone, as shown in Fig. 1, is subject to considerable variation because of discrepancy of the methods used for counting total leucocytes and live and dead leucocytes. In the methylene blue stained preparations for total leucocyte counts, large fragments of disintegrated leucocytes with stainable nuclei are generally counted as cells, whereas, in the trypan blue staining method for counting the proportion of live and dead leucocytes only the intact whole cells are enumerated. Addition of surfactants increased the initial rate of O_2 release and caused the catalase reaction to reach completion in about 90 min (Fig. 2), because almost all of the leucocytes had died and released their catalase by about 40 min (Fig. 1). Catalase was completely released from leucocytes by insonation without loss of activity.

Results of this study indicate that catalase is an intracellular enzyme and the role of H_2O_2 in the catalase test is to cause death of leucocytes, thus releasing the catalase and then providing substrate for the enzyme.

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AIR QUALITY IN FLUID AND MANUFACTURED MILK PRODUCTS PLANTS[1, 2]

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Abstract

Forty responses were obtained from a questionnaire sent to regulatory agencies of market milk and manufactured dairy products of the 50 state governments. Replies indicated that air-borne contamination was considered most important in the commercial processing or manufacture of cultured milks followed by dry milks, cheese, market milks, ice cream, and butter in decreasing order of importance. However, a high percentage of replies signified a lack of knowledge of air-borne contamination in processing or manufacture of dairy products.

Air was sampled using the Casella sampler to ascertain the standard plate count and yeast and mold count in critical product areas of various size dairy plants in nine states. The following results were obtained/ft^3: *(a)* cheese: SPC, >115.7 mean and 3 to >702 range, yeast and mold, 29.1 mean and 1 to 99 range; *(b)* dry dairy products: SPC, 31 mean and 8 to 60 range, yeast and mold, 28.9 mean and 3 to 84 range; *(c)* market milk: SPC, 31.3 mean and 4 to 89 range, yeast and mold, 30.8 mean and 0 to 132 range; *(d)* butter: SPC, 45.2 mean and 11 to 132 range, yeast and mold, 12.3 mean and 4 to 26 range; and *(e)* ice cream: SPC, 16.4 mean and 10 to 25 range, yeast and mold, 8.4 mean and 4 to 16 range.

The most obvious increase in bacteria counts seemed to be caused by an increase in number of people passing close to the sampling probe and a greater amount of dust from unpaved roads adjacent to the plant.

The microbiological quality of air in plants manufacturing dairy products and those processing milk has become of greater concern in recent years. The need for longer storage life, greater emphasis on quality and uniformity, and the necessity to maintain a zero tolerance on pathogenic organisms are contributing factors.

The microbiological content of air is generally regarded with concern if it contacts the dairy product after pasteurization (for example, in filling containers) or during manufacture (as with cheese). Less obvious possibilities of contamination occur if the air carries organisms into the containers or deposits them on equipment surfaces (after sanitizing) that subsequently contact the pasteurized product. Others are air agitation of pasteurized product and head space in storage and balance tanks for pasteurized dairy products. Conceivably certain types of air-borne contamination (bacterial spores) in raw milk could adversely influence the keeping quality of the resulting sterilized products.

The ideal plants from the viewpoint of preventing air-borne contamination would be those that process or manufacture dairy products in a closed system. The next best would be those having ultraclean room practices with no people or as few as possible in the important areas. Until these become feasible, attention will have to be given to eliminating as much air contamination as practical to safeguard against pathogenic and all other undesirable microorganisms.

A literature review reveals many studies on various aspects of air-borne contamination, particularly on methods, numbers and sources of microorganisms, and human shedding. Evaluation of air counts by exposure of petri plates with sterile agar has been used for many years. The limitations resulting from varying air currents and from the very slow settling rate of the smallest microorganisms have resulted in the development of more positive methods. Wells *(19)* used centrifugal force, Berry *(1)* an electrostatic technique, Bourdillon et al. *(2)* a slit sampler, Lemon *(12)* liquid impingement, Silverman and Viles *(16)* filtration, and Kethley et al. *(10)* thermal precipitation.

Fabian *(6)*, in 1927, was one of the first to report on air-borne contamination of a dairy product. With the aeroscope and sedimentation methods he observed that bacterial contamination of ice cream by air was insignificant. The number of bacteria in the air of the ice cream area varied widely during the year (daily mean 0.25 to 69.50/liter). The mold daily mean was 0 to 5.75/liter. Major influencing factors were dry windy weather, open doors and windows, dry floors, and operating machinery.

Grimes et al. *(7)* emphasized the possibilities of air-borne mold infecting cream after pasteurization and butter during packaging. Macy et al. *(13)* reported that during July through April petri plates exposed for 10 min had yeast and mold counts of 0 to 43 and 0 to 25, respectively, in a creamery.

Forty-one trials showed an average of 166.5 (range of 18-516) bacteria per hr on 90 mm petri plates in the butter area of a plant *(14)*. The results for market milk and cheese areas were, respectively, 185.9

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[1]Paper presented at the 55th Annual Meeting of the International Association of Milk, Food, and Environmental Sanitarians. St. Louis, Missouri, August 18-22, 1968.

[2]Michigan Agricultural Experiment Station Journal Article No. 4523.

with a range of 7 to 734 and 144.7 with a range of 12 to 686. The yeast counts in the three areas averaged 4.5 and varied from 0 to 43. The molds averaged 54.4 with a minimum of 2 and a maximum of 302 per hr exposure. The authors concluded there was little seasonal variation in numbers of bacteria, yeast, or molds and little difference between outdoors and indoors in plate counts.

Cerna *(5)* observed a range of 1 to 550 bacterial colonies per plate for 10-min exposure in European dairies. Labots *(11)* also ascertained air-borne counts in European dairies. He observed an average of 18 colonies per liter with a slit sampler and 300 per petri plate per min. Perry et al. *(15)* investigated the lactobacilli in the air of seven creameries and found $<1/ft^3$ to $>65/ft^3$.

More recently Heldman et al. *(9)* and Hedrick et al. *(8)* reported a total mean daily average of 27 bacteria/5 ft^3 with a mean daily range of 9.4 to 52.5 for 315 samplings in a dairy plant. Mold count was 67.9 for total daily mean with a mean daily range of 7.2 to 334.4. The yeast counts were lower. The average of the daily mean was 10.3 and the mean daily range was 1.4 to 30.0 for 282 samplings involving six days. Two years later, Sunga et al. *(17)* found that the average bacteria count of the air in the same areas of the dairy plant had increased to 58/5 ft^3. This increase was attributed to more dust from new building construction close to the plant.

Cannon's *(3)* viable non-mold count was $92.3 \pm 149.6/ft^3$ in the air of 10 fluid milk plants. The viable mold count was $51.3 \pm 108.0/ft^3$. The counts varied widely among the plants and within individual plants.

Cannon and Reddy *(4)* observed that the correlation coefficient between viable particles in air (Anderson sampler) and sedimentation (5 min standard petri plates and agar) was 0.797. They calculated that with a viable count of $87/ft^3$ the contamination rate of 500 gal of milk in 1,000-gal horizontal storage tank was 0.011 microorganisms/ml/hr by sedimentation and 0.139/ml by aspiration.

The species of organisms in dairy plant air have received only limited research attention. Fabian *(6)* stated that most of the bacteria in the air in the ice cream area were peptonizers, alkali producers, or inert. A few were weak acid producers. Since humans are known to be a major source of microorganisms in dairy plant air, Sunga et al. *(18)* isolated bacteria shed from the arms and hands of four dairy plant workers. Of the 256 organisms identified, 55.4% were cocci, 41.4% rods, and 3.2% yeasts. *Sarcina flava, Peptococcus prevotii, Sarcina aurantiaca, Sarcina hansenii, Staphylococcus epidermidis* and *Sarcina lutea* occurred most frequently among the 13 species of cocci isolated. *Alcaligenes marshallii, Alcaligenes bookeri, Pseudomonas synxantha, Pseudomonas iodinum, Pseudomonas fluorescens* and *Corynebacterium striatum* were the most common rods of the 18 species identified.

The principal sources of air-borne microorganisms in dairy processing and packaging areas are human shedding, floor drains, ventilation systems, supplies, unsanitary storage rooms, and the outside atmospheric conditions, e.g. congestion and dust *(8)*.

This report presents the responses of state officials regarding the importance of air in contaminating dairy products and the suggested maximum limits for microbiological content of air in market milk, cultured milk, cheese, butter, ice cream, and dry milk areas and/or plants. The results of standard plate counts and yeast and mold counts on air in market milk, cheese, butter, and dry milk areas of dairies in nine states will be presented.

EXPERIMENTAL

A question sheet was prepared and mailed to the state dairy regulatory officials of each state. If two agencies were involved, for example, one for market milk and another for manufactured products, each received the questionnaire. The appropriate officials were asked to check the importance of air-borne microorganisms as a source of contamination in *(a)* milk and cream area: "very___, medium___, slight___, not important___, or don't know___." Space was provided for suggesting the air-borne bacteria count be limited to: "___/ft^3 or ___colonies/10 min sterile agar plate exposure or no limit necessary___." The information was requested also on air-borne yeasts and molds.

Similar information was asked for *(b)* cultured milk area, *(c)* cheese area, *(d)* butter area, *(e)* ice cream area, and *(f)* dry milk area. Suggested sources of original contamination also were requested when air-borne contamination was considered important.

The Casella sampler with standard plate count agar or acidified potato dextrose agar was used to ascertain the microbiological content of dairy plant air in nine states (Indiana, Iowa, Michigan, Minnesota, Montana, North Dakota, South Dakota, Washington, and Wisconsin). Variation in size, type, and location (in relation to industrial, residential, and rural areas) of dairy plants was obtained. Sampling was conducted without advanced notice to management. In general, the weather was hot and the relative humidity medium to high.

In the market milk area of the plant the sampling probe was placed within a few inches of the exposed cartons or bottles ahead of filling. The probe was located close to, but 6 in. higher than the vat for sampling air during the manufacture of Cottage or Cheddar cheese. In the butter area, the air was sampled close to the packaging in bulk cartons or near the printing of retail packages. In the ice cream area, the sampling of air was near (within 12 in.) the container filling activity. The probe in dry milk plants was placed near the bag filling or retail package filling operation.

The sampling was in duplicate for standard plate counts and for yeast and mold counts and consisted of 1 ft^3 of air per sampling. Although the testing was confined to these four tests per product area, it varied in time of day among

TABLE 1. SURVEY OF STATE OFFICIALS ON AIR-BORNE MICROBIOLOGICAL CONTAMINATION IN DAIRY PRODUCTS

	Market milks	Cultured milks	Cheeses	Butter	Ice creams	Dry milks
Importance of air-borne contamination:						
Very	5.3%	51.6%	16.7%	6.7%	6.3%	16.7%
Medium	26.3	9.7	20.0	10.0	25.0	30.0
Slight	15.8	3.2	6.7	16.7	25.0	3.3
Not important	10.5	0	0	10.0	6.3	0
Don't know[a]	42.1	35.5	56.7	56.7	37.5	50.0
Total respondents	38	31	30	30	32	30
Suggested maximum limits:						
Bacteria/ft^3	15 (2)[b]	10-500 (3)	20 (2)	20 (2)	20 (2)	15 (2)
Bacteria/10 min	5-25 (8)	0-100 (11)	5-25 (6)	10-25 (4)	5-100 (9)	5-100 (8)
No limit necessary	– (6)	– (4)	– (5)	– (7)	– (7)	– (5)
Yeast and molds/ft^3	15 (2)	0-10 (3)	20 (2)	20 (2)	20 (2)	15 (2)
Yeast and molds/10 min	2-15 (7)	0-20 (10)	5-20 (6)	5-20 (4)	2-10 (7)	2-15 (6)
No limit necessary	– (7)	– (4)	– (5)	– (7)	– (8)	– (5)

[a]Didn't know or omitted a reply.

[b]Number in parentheses is the number of replies.

plants from the initial filling through clean-up at the end of the operation. For cheese the sampling occurred at any period from setting the milk until packaging of Cottage cheese or placing the Cheddar curd in the hoops. The agar plates for standard plate count were incubated at 32 C (48 hr) and at 21 C (5 days) for the yeast and mold count.

RESULTS AND DISCUSSION

Survey of state officials

The results represent 40 state officials who replied and are presented in Table 1. Approximately one-third to more than one-half of the respondents didn't know or omitted a reply to the questions on importance of air-borne contamination for the six dairy product areas. This high percentage probably results from the scarcity of certain product processing plants within some states. A number of officials reported that there were no butter plants or dry milk plants within the state. Some indicated a scarcity of cheese plants. Another reason may be the lack of practical information on the effect of air-borne microorganisms as a source of contamination for dairy products, especially market milk and ice cream. The emphasis of air-borne contamination has been mostly limited to aseptic packaging of sterilized fluid products and as a source of bacteriophage in culture and starter preparation. But, recently the importance of air-borne microorganisms in dry milk areas has been receiving much attention to emphasize *Salmonella*-free products. There is a lack of obvious reasons for the officials giving greater importance to air-borne microorganisms in ice cream areas of the plant than the butter areas.

Numerous officials mentioned that one principal consideration in evaluating the importance of air-borne contamination was the extent of product exposure. Closed systems would be expected to eliminate air contamination. One official indicated that establishing standards based upon number of organisms present in the air was not realistic with the type of operation in the dairy industry. Some officials emphasized that the species of organisms were much more important than the numbers.

Common sources of microorganisms in the air mentioned most often in the replies were "excessive traffic (human) in processing areas," "clothing of personnel," "dust," "outside air or surrounding environment," and "ventilation system" (failure to maintain filters or ducts). "Cartons in storage" was mentioned as a source for several dairy products. In specific reference to air contamination of dry milks additional suggestions included "dirty ledges, unclean walls and ceilings," and "floor drains."

Only two or three respondents proposed a standard plate count or yeast and mold count limit based upon the volume of air (ft^3). A few more suggested maximum limits based on exposure of agar plates

TABLE 2. MICROORGANISM COUNTS ON AIR IN DAIRY PLANTS

Product	Number of plant areas		Number of colonies Range	Mean
Butter	6	SPC	11- 132	45.2
(near packaging)		Y&M	4- 26	12.3
Cheeses	14	SPC	3->702	>115.7
(near vats or packaging)		Y&M	1- 99	29.9
Dry milks	9	SPC	8- 60	31.0
(near bagging or retail carton packaging)		Y&M	3- 84	28.9
Ice cream	5	SPC	10- 25	16.4
(near packaging)		Y&M	4- 16	8.4
Market milks	14	SPC	4- 89	31.3
(near fillers)		Y&M	0- 132	30.8

TABLE 3. PROPOSED TENTATIVE LIMITS FOR AIR-BORNE COUNTS IN DAIRY PLANT AREAS

Rating		No./ft³ or less Butter	Cultured milks, creams and unripened cheeses	Ripened cheeses	Dry milks	Market milks and creams
Good	SPC	10	5	10	8	5
	Y&M	5	4	12	5	2
Poor	SPC	50	35	50	40	40
	Y&M	25	20	50	35	34

(petri) for 10 min. A large per cent of the respondents did not believe they had sufficient data to propose limits for the air of the six product areas. The strictest limit was 0 bacteria per 10 min of plate exposure in cultured milk area with the highest suggested maximum of 100. Suggestions ranged from 5 to 25 for market milk area; 5 to 25 for cheese; 10 to 25 for butter areas and 5 to 100 for ice cream and dry milk areas. The maximum of 500/ft³ suggested by one official for cultured milk is difficult to rationalize in comparison to the stricter limits set in other product areas and especially in view of the fact that the official marked air-borne contamination control as very important for cultured milk.

The maximum yeast and mold counts proposed were all within the range of 0 to 20 per 10 min of exposure, but varied for each product area.

Air-borne counts in dairy plant areas

Results of the standard plate counts and yeast and mold counts (Casella sampler) on the air in 23 plants (48 product areas) in nine states are presented in Table 2. Air in the cheese areas had the highest mean standard plate count and the lowest mean was in ice cream areas with dry milk second. The low average for dry milk areas probably reflects the recent emphasis on more thorough sanitation to reduce the possibility of *Salmonella* contamination. As might be anticipated, the highest mean yeast and mold count was in the air of the Cheddar cheese manufacturing areas, but the lower counts in the Cottage cheese areas resulted in a mean for cheeses that was comparable to the market milk and dry milk areas.

A study of microorganism counts of the air in relation to plant conditions—physical, sanitary, human activity, and environment—indicates some general correlations. A large amount of human activity near the air sampling probe usually caused higher bacterial counts. A high dust content in air from unpaved roads adjacent to the plant seemed to cause high counts in plants without a filtering system for inlet air. In general, the large new dairy plants with good sanitation had lower air-borne counts than the small crowded plants in old buildings.

A thorough investigation under practical conditions is needed to determine the effect of various numbers of air-borne microorganisms in the critical areas of the dairy plant on the processed and manufactured products. The need for legal standards is certainly debatable at this time. However, tentative guidelines on the microorganism content of air in the dairy plant might be useful as an index of certain sanitary conditions and for minimizing adverse effects on quality and/or keeping quality of dairy products, especially the cultured products.

On the basis of the limited data available from dairy plant testing of air-borne counts, values in Table 3 are suggested as a guide in areas where product contamination from air can occur.

As more becomes known about the specific product contamination from air-borne microorganisms and the total effects on each dairy product, revision of the limits may be warranted.

ACKNOWLEDGMENT

Sincere appreciation is expressed to the management of the dairy plants involved for their excellent cooperation in obtaining air-borne counts and to the state dairy and health officials for their replies to the survey.

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ASSOCIATION AFFAIRS

REPORT OF THE 3-A SYMBOL COUNCIL—1967-1968

This is the first time, in a number of years, that it has become necessary to report that the number of 3-A Symbol Council authorizations in effect has declined during the preceding 12 months. At the 1967 Annual Meeting it was reported that five authorizations covering manually-operated bulk milk dispensers were still tentatively in effect, because of residual inventories of dispensers built to 3-A Sanitary Standards in hands of manufacturers, although those standards had been rescinded as of April 20, 1967. The Board of Trustees of the Council decided that authorizations automatically terminated on the date the 3-A Sanitary Standards were rescinded. Consequently, rebates of fees covering the intervals between April 20, 1967 and the date on which authorizations normally would have expired were made to five authorization holders. These authorizations should not have been included in the 1967 column of the tabulation in last year's report. One initial authorization has been issued for each of the following types of equipment; automotive milk transportation tanks, fittings, and batch pasteurizers. Five fabricators of farm bulk milk tanks have discontinued their manufacture since the last renewals were issued. And one manufacturer of pumps, one fabricator of carton fillers and sealers, and one manufacturer of a valve, have relinquished their authorizations. As a result of these issuances, automatic termination of authorizations, and relinquishments the number of authorizations in effect on July 31, 1968 is lower by 9 than it was on August 1, 1967; totalling 142 as compared with 151. A tabulation of authorizations in effect on those two dates, by equipment category, is appended to this report. Rosters of holders of authorizations, as of August 20, 1967 and of February 20, 1968, were published in the September, 1967, and March, 1968, numbers of the Journal. The roster as of August 20, 1968 will no doubt appear in the Journal of September, 1968.

The Board of Trustees of the Council has held only one meeting during the interval covered by this report. At that meeting, held prior to the October, 1967, Omaha meeting of the 3-A Sanitary Standards Committees, several matters of interest to Association members were considered.

One was an application for an authorization covering a pump of the plunger type, normally operated at a pressure considerably lower than those at which homogenizers operate, and having a quite different application. The 3-A Sanitary Standards for pumps pertain only to rotary pumps, and those for homogenizers may be applied to "high-pressure pumps of the plunger type." The trustees decided that no existant 3-A Sanitary Standards provide a basis for the issuance of an authorization covering a pump of the type in question.

The 3-A Sanitary Standards for stainless steel automotive milk transportation tanks do not provide for their compartmentalization. It is, however, conventional practice among Canadian fabricators of farm milk pick-up tanks to assemble, in one outer shell, two or three separate tanks or compartments, with all outlets terminating in the rear cabinet. Reasons cited for this design are increased traction under partial loads, and other advantages. This type of construction necessitates long outlet passages from the forward compartments. Compartment outlet pods illustrated in drawings are of various design, and the effectiveness of the washing of those several designs, as well as of the long passages, is subject to question. It must be realized that the 3-A Sanitary Standards do not make the installation of equipment for circulation washing and sanitation mandatory.

The Secretary of the Council took the position that compartmentalized milk transport tanks do not conform to the 3-A Sanitary Standards for that equipment, but did issue authorizations, limited to single compartment tanks, to six Canadian fabricators. The Trustees supported that position.

3-A SYMBOL COUNCIL AUTHORIZATIONS IN EFFECT

Standards Serial No.	Type of Equipment	July 31, 1967	July 31, 1968
0102	Storage Tanks	17	17
0204	Pumps	13	12
0300	Weigh Cans	0	0
0402	Homogenizers	3	3
0506	Automotive Tanks	18	19
0600	Electric Motors	—	—
0700	Can-Type Strainers	0	0
0807	Piping Fittings	14	15
0902	Thermometer Fittings	1	1
1002	In-Line Filters	1	1
1102	Plate-type Heat Exchangers	7	7
1202	Tubular Heat Exchanges	3	3
1303	Farm Milk Cooling Tanks	24	19
1400	Leak-Detector Plug Valves	4	4
1500	Bulk Milk Dispensers	5[a]	—
1603	Evaporators and Vacuum	7	7
1702	Fillers and Sealers	6	5
1901	Ice Cream Freezers	2	2
2201	Silo-Type Storage Tanks	8[b]	8
2300	Cottage Cheese Packagers	3	3
2400	Batch Pasteurizers	5	6
2500	Batch Processors	5[b]	5
2600	Dry Milk Sifters	5	5
	Total	151	142

[a]Should not have been included
[b]One authorization issued in July not included in 1967 report

No authorization covering plastic tubing has yet been issued, in spite of the fact that this product is widely used, and that the 3-A Sanitary Standards for multiple-use plastic materials have been in effect slightly more than four years!

These examples of the action of the Board of Trustees have been presented to acquaint members of the Association with the nature of the activities of the 3-A Symbol Council, of which the Association is a participating member. Routine activities, such as reviewing applications and issuing renewal certificates are conducted almost daily. Also to emphasize that the 3-A Symbol Council provides the field tests for 3-A Sanitary Standards. Many of the numerous amendments and supplements of most of the 3-A Sanitary Standards published prior to 1963 have been initiated because of relevations, in the course of review of applications for authorizations, of gaps or ambiguity of text, or the need for extension of their coverage.

C. A. ABELE
Secretary-Treasurer
D. C. CLEVELAND
J. G. MEANY
K. G. WECKEL

REPORT OF THE COMMITTEE ON COMMUNICABLE DISEASES AFFECTING MAN, 1967-1968

The activities of this committee were minimal this year following a minor change made before the third printing of the second edition of *Procedure for The Investigation of Food-borne Disease Outbreaks*. The first edition of this manual, published in 1956, sold 35,00 copies. The manual was brought up-to-date in 1966 and published as the second edition. Three printings of 5,000 copies each have been made of the second edition, bringing the total sale of the manual to nearly 50,000. In addition, recently the manual has been translated into Spanish by the Pan American Union. Several thousand copies have been distributed by them in Central and South America.

The committee welcomes any comments or suggestions members may wish to make. Minor changes, when approved by the committee, can be incorporated in the next printing of the manual. Major changes will be kept on file until the third edition is prepared.

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REPORT OF THE COMMITTEE ON FOOD PROTECTION, 1967-1968

The committee feels that it would be most advantageous to improve existing food protection programs by trying to encourage communications and cooperation between the various levels of government, local, state, and federal.

To accomplish this objective, the Committee is trying to develop a series of regional seminars on food protection. Representatives of local, state and federal regulatory agencies would be invited to attend these seminars, to discuss food protection problems, and the development of a comprehensive protection plan encompassing all levels of government. Other interested organizations, such as the Institute of Food Technologists, would be invited, for an effort should be made to improve communications between regulatory agencies and industry on the existence of hazards and methods of correction.

The result of these regional seminars, we hope, would be improved and extended food protection programs through improved communications, inter-agency cooperation, and improved communications between government and industry.

OBJECTIVES

To provide international leadership in the prevention and control of food-borne diseases through: *(a)* identification and evaluation of microbial, chemical, readiological and physical hazards associated with the processing, transportation, storage, handling and service of foods and animal feeds; *(b)* encouraging the conduct of research to provide data needed to develop effective, practical control measures; *(c)* promoting improved reporting of food-borne disease outbreaks; *(d)* encouraging development of improved methodology for detection of food-borne pathogens and hazardous chemicals in market foods; *(e)* encouraging the development of model laws and regulations for the control of food hazards, and promote their

uniform adoption and application by State and local regulatory agencies; *(f)* promoting the development of regional and/or national certification programs designed to assure the safety of foods moving in inter-jurisdictional shipments; *(g)* studying existing and new processing and serving practices and techniques to assure the incorporation of new and improved food protection measures; *(h)* lending support to agencies and groups concerned with the training of industry and regulatory agency personnel; *(i)* assisting any agency or group engaged in the eradication of food-borne hazards from market foods; i.e. salmonellae in eggs, dry milk, cake mixes, etc.; and *(j)* provide technical and consultative assistance to any segment of the food industry and to regulatory agencies in matters of food protection.

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DR. JAMES C. WHITE, Department of Food Science, Cornell University, Ithaca, New York.

DR. K. G. WECKEL, Department of Food Science and Industries, University of Wisconsin, Madison, Wisconsin 53706.

ELMER D. MCGLASSON, Milk and Food Branch EEFP, Public Health Service, Washington, D. C. 20201.

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REPORT OF THE COMMITTEE ON SANITARY PROCEDURE, 1967-1968

The following is a report of the activities of the Committee on Sanitary Procedures from July 1, 1967 to July 1, 1968.

1. *3-A Sanitary Standards Committees Meeting—Omaha, Nebraska, October 3, 4, 5, 1967.*

Representing CSP-IAMFES were—C. A. Abele, D. C. Cleveland, D. J. Conner, H. R. Irvin, W. M. Jordan, Joseph S. Karsh, C. K. Luchterhand, S. O. Noles, O. M. Osten, R. M. Parry, J. C. Schilling, R. Anderson sat in for F. Fenton who was unable to attend, H. L. Thomasson, K. G. Weckel and D. B. Whitehead.

This meeting constitutes another "program in action" effort made possible by the sincere objective work done in *ad hoc* deliberations earlier in the year. I do not mean to imply that there was not some spicy confrontation and testing of mettle, all in good humor, but this is the very ingredient of this 3-A venture that seals the solidarity of purpose of the committees, as well as assuring credibility for the Standards and Practices. In joint 3-A session the following were adopted to be prepared for signature and publication: *(a)* 3-A Accepted Practices for the Design, Fabrication and Installation of Milking and Milk Handling Equipment, Second Revision, August 21, 1967; *(b)* Tentative 3-A Sanitary Standards for Equipment for Packaging Dry Milk and Dry Milk Products, Fifth Revision, June 14, 1967; *(c)* Tentative Amendments to 3-A Sanitary Standards for Milk and Milk Products Filters Using Disposable Filter Media, Serial No. 1002, First Revision, April 7, 1967.

CSP-USPHS heard an explanation of the Tentative Amendment to the Fitting Standards No. 0809, and asked the Task Committee to supply supplementary information relating to performance and wall thickness dimensions of rubber and plastic tubing. Press of time did not permit further study by CSP-USPHS.

2. The value and credibility of the work of the 3-A Committees was presented at 6 *F.D.A. Workshops* by D. B. Whitehead, discussing "Equipment Design As It Relates to Sanitation." These workshops were directed to "Bacteriological Problems in Convenience Foods." Workshops were held at the following places: Albany, New York—October 24, 1967; Syracuse, New York—October 26, 1967; Hamburg, New York—October 31, 1967; Greensburg, Penn.—November 2, 1967; Chicago, Illinois—Feb. 7 and 8, 1968 (Joseph Karsh was able to attend this metting).

There were approximately 650 industry and regulatory personnel in attendance at these 6 meetings. The interest expressed for extension of 3-A to the convenience foods field was impressive. Every effort is being made to properly inform this segment of the milk and food industry of the possibilities and the sources of further information.

3. It was the privilege of the Chairman of the CSP to represent CSP as the Chairman of the Dairy Industry Committee on behalf of the 3-A Committees, to present a scroll to the Surgeon General in tribute to the milk and food activities of USPHS. The presentation tok place in the Surgeon General's Office, National Institute of Health, Bethesda, Maryland, November 28, 1967.

4. *3-A Ad-Hoc Meeting on HTST Pasteurization.* This meeting was a demonstration at the Beatrice Foods Company Plant, New Bremen, Ohio, February 9, 1968. The purpose of this demonstration was related to the acceptable use of the positive high-pressure pump as a timing pump downstream from the flow diversion valve in a spray drying operation. D. B. Whitehead represented CSP at this meeting. This demonstration was well attended—a total of 14 *ad-hoc* committee members being present. The committee is to resolve the following 3 questions raised during the course of this demonstration and subsequent discussion: *(a)* Can the time/temperature of 175 F for 25-seconds be adhered to commercially? *(b)* Is test for holding time by calculation valid in practical application? and *(c)* Is the air operated double valve flow-diversion valve properly protected against vacuum withdrawal of product from the balance tank?

5. Participation of members of CSP in *Cornell University C.I.P. Conference* is worthy of note. C. A. Abele and D. B. Whitehead appeared as speakers on the program representing the philosophy and practices recommended by 3-A. Dr. W. M. Jordan also was in attendance during the course of this Conference.

6. *3-A Sanitary Standards Committees Meeting—St. Paul, Minnesota May 7, 8, 9, 1968.*

Representing CSP-IAMFES were —C. A. Abele, D. J. Conner, H. R. Irvin, W. M. Jordan, R. M. Parry, J. S. Karsh, C. K. Luchterhand, O. M. Osten, J. Schilling, G. H. Steele, R. Anderson sat in for F. Fenton who was unable to attend, H. L. Thomasson and D. B. Whitehead. S. Noles was unable to attend due to having been hospitalized on an emergency. As of this writing, he is back on the job on a limited basis.

Action of a responsive nature was taken by CSP-USPHS as follows:

(a) Tentative amendment to 3-A Accepted Practices for the

sanitary construction, installation, testing and operation of high temperature, short time pasteurizers, revised, third draft, February 9, 1968. USPHS asked for time for their research personnel to review certain suggestions made at the joint session. The results of their review will be available to all groups. By consent the reviewing groups were asked to resolve the final issues on an *ad hoc* basis, and attempt to get the amendment adopted and signed prior to the next 3-A meeting.

(b) Tentative amendment to 3-A sanitary standards for internal return tubular heat exchangers for use with milk and milk products, serial No. 1203, third draft, October 4, 1967. This tentative amendment was reviewed by the CSP-USPHS group which reported back to the joint session that it had some suggestions for changes in the draft. The suggested changes involved clarification of the equipment under consideration.

(c) Tentative amendment to 3-A sanitary standards for milk and milk products evaporators and vacuum pans, serial No. 1604, second draft, October 4, 1967. This tentative amendment was reviewed by the CSP-USPHS groups which reported back at the joint session suggesting changes for the purpose of clarification. The tentative amendment was referred back to the Task Committee for a new draft and scheduling on the agenda of the next 3-A meeting.

(d) Tentative amendment to 3-A sanitary standards for stainless steel automotive milk transportation tanks for bulk delivery and/or farm pick-up service, serial No. 0507, Initial draft, July 12, 1967. This tentative amendment was reviewed by the CSP-USPHS groups which reported back to the joint session on certain specific needs for clarification. It is hoped that the comments of CSP-USPHS will be acceptable to the rest of the 3-A committees making it possible for the new amendment to be signed prior to the next 3-A meeting.

(e) Tentative revision to 3-A sanitary standards for fittings on milk and milk products equipment and used on sanitary lines conducting milk and milk products, serial No. 0800, fifth draft, October 3, 1967. The complete revision of the 1950 fittings standard was reviewed during the course of this meeting by the CSP-USPHS groups. A new draft reflecting the comments made by CSP-USPHS will be prepared for scheduling on the agenda of the next 3-A meeting.

(f) Tentative 3-A sanitary standards for milk and milk products evaporators and vacuum pans, revised, serial No. 1605, third draft, October 3, 1967. This revision was reviewed by the CSP-USPHS groups, and the results of their review and the comments which developed during the review were reported to the joint session. Hopefully, it may be possible to finalize this tentative revision preparatory to adoption at the next 3-A meeting.

(g) Tentative 3-A sanitary standards for storage tanks for milk and milk products, revised, serial No. 0103, third revision, April 6, 1967. This tentative revision was carefully reviewed by CSP-USPHS groups. In the interest of upgrading, the task committee was asked to re-study and prepare a new draft which can be considered on the agenda of the next 3-A meeting.

(h) Rescinding amendments. The 3-A committees concurred in the action taken by the Steering Committe and the tentative rescinding amendments were dropped from the agenda.

Although this meeting did not produce documents ready for signature, it was, nonetheless, extremely important and productive. The study and deliberation at this meeting will make possible the completion of most of the referenced items above.

7. I wish to welcome J. C. Schilling, Chief—Milk Control, Division of Health, Milk Control Section, St. Louis, Missouri, as a regular member of the committee replacing the late Dr. M. R. Fisher, and Dr. J. C. Olson, Jr., Director of the Division of Microbiology, Food & Drug Administration, Washington, D. C., as an officially appointed observer on the CSP.

I wish to commend the excellent participation of the members of CSP in response and contribution, both in and out of formal meetings. I wish to note for the record that many individuals on the committee have participated in meetings, not noted here, that have advanced the cause of 3-A. There is no doubt, it is their extreme modesty that has kept the details from this record. It appears, at this writing, that some definite interest on the part of the poultry industry is about to "hatch."

This report is respectively submitted by the members of the Committee on Sanitary Procedures who are: D. B. Whitehead, *Chairman;* C. A. Abele, D. C. Cleveland, D. J. Conner, P. J. Dolan, H. Irvin, W. K. Jordan, J. J. Karsh, K. Carl, C. K. Luchterhand, J. A. Meany, S. O. Noles, O. M. Osten, R. M. Parry, H. L. Thomasson, F. E. Fenton, J. C. Schilling, and J. C. Olson, Jr.

REPORT OF THE COMMITTEE ON FOOD EQUIPMENT SANITARY STANDARDS, 1967-1968

The IAMFES Committee on Food Equipment Sanitary Standards, known hereafter as the committee, is charged with the responsibility of cooperating with other interested health organizations and related industries in the formulation of sanitary standards and educational materials for the fabrication, installation, and operation of food equipment and to present to the membership those standards and educational materials which the committee recommends be endorsed by the association.

The purpose of this cooperative program is to aid industry in improving the design, construction and installation of equipment so that it will lead to easy cleaning and proper functioning when placed into service in food establishments. It is the committee's further purpose to cooperate with industry in the preparation of standards or guidelines which public health agencies will accept, thereby securing uniformity in the manufacture and nationwide acceptance of such equipment.

The following report will outline the committee's activities during the past year in working with two health and industry organizations (National Sanitation Foundation's Joint Committee on Food Equipment Standards and the National Automatic Merchandising Association's Automatic Merchandising Health-Industry Council) and progress in meeting its purposes and objectives. It is expected these organizations will be the two groups that the committee will work with during the coming year.

NATIONAL SANITATION FOUNDATION (NSF)

The committee was represented at the 1968 meeting of the National Sanitation Foundation's Joint Committee on Food Equipment Standards, where action was taken on several proposals; and prior to the meeting, the committee reviewed and submitted comments on each draft of these proposals. Since the meeting, the committee has also re-

viewed and submitted comments on proposed changes to existing standards.

Manual on installation of food service equipment

The Joint Committee reviewed the 6th and final draft of the proposed *Manual on Sanitation Aspects of Installation of Food Service Equipment*. Before the Joint Committee recommended approval of this document, several significant modifications were made in the proposal including *(a)* the deletion of the objectionable note on the lack of need for any specifications for spacing equipment not sealed to adjoining walls and equipment, and *(b)* the inclusion of Standard No. 2's requirements for specific distances between and behind equipment where such equipment is not sealed to adjoining surfaces. This manual is intended for broad usage by many groups including public health officials, food service operators, food service consultants, architects, etc., and is designed to aid them in promoting uniform standards and ease of maintenance through proper installation of food service equipment.

Criteria no. 2

Most of the NSF Standards and Criteria No. 2 contained specifications for ventilation louvers and openings, but there was very little uniformity in these specifications even though the intent of each of them was basically the same. Therefore, an NSF Special Task Committee was appointed and reviewed the various requirements for louvers and openings as contained in the existing Standards and Criteria. These requirements, which were amended, where indicated, consolidated and made applicable to all Standards and Criteria, are listed below as approved by the Joint Committee:

Louvers or openings located in the splash zone shall conform to the following: *(a)* be of drip deflecting design, *or (b)* be so located as not to be subject to splash, splatter, spillage or overhead drippage, *or (c)* be so designed and constructed as to be readily accessible and the space behind same to be easily cleanable.

Louvers shall be large enough or so spaced to allow for ease of cleaning between louvers and shall be free of sharp edges and burrs. Where necssary, louvers shall be designed to minimize, or eliminate, contamination from spillage and/or upward splash. Screening on openings, if provided, shall be 16 mesh, or equivalent, and in a removable sash to facilitate cleaning.

Standard no. 2

The proposed requirements for wooden-top baker's tables were reviewed and recommended for approval by all but two of the public health representatives on the Joint Committee (only public health representatives on the Joint Committee are permitted to vote on Standards or Criteria). In the opinion of the IAMFES representative, the study on which the proposed requirements were based failed to prove the suitability of wood for use as a food contact surface.

At the request of the 1967 Joint Committee, the NSF Staff surveyed the degree of corrosion of shelving and shelving material in use in refrigeration equipment. The survey revealed the following interesting information:

Shelving Material	No. of Units Evaluated	% of Units Showing Degree of Corrosion None	Some	Bad
Galvanized	37	43.3	32.4	24.3
Chrome Plated	44	14.7	53.0	32.3
Painted	7	14.3	28.6	57.1
Stainless Steel	4	100.0	0	0
Nickel Plated	2	0	50	50
TOTAL	94			

In response to a request from this Committee, the Joint Committee discussed the subject of cold pans and the fact that such refrigeration holding equipment was not evaluated under either Standard No. 2 or 7. In the opinion of the NSF Staff, cold pans at cafeteria counters, and at related serving areas are not required to comply with NSF Standard No. 7 inasmuch as they are intended for display rather than for storage of food. The Joint Committee felt that the present interpretation and application thereof would not aid the user in properly protecting hazardous food on display and recommended that a special task committee be appointed (such a committee has been appointed) to study this matter and report its findings to the Joint Committee in 1969.

Standard no. 4

The proposed amendment to Standard No. 4 relating to fat filters was approved by the Joint Committee after lengthy discussions. Some improvements were made in the proposal by the Joint Committee during the meeting. However, the representative of this committee did not feel that the proposal was significantly improved over the one disapproved by mail ballot by the Joint Committee in 1967; and, consequently, the committee's representative again voted against this proposal.

The NSF Staff and manufacturer demonstrated a piece of equipment designed to cook whole unpeeled potatoes in a rosin bath. The members of the Joint Committee agreed that the equipment and operation would be acceptable providing the following requirements are met: *(a)* the rosin complied with the toxicological requirements of the Federal Food and Drug Act, *(b)* the cleanability procedures recommended by the manufacturer were found adequate, and *(c)* the material, design and construction of the unit complied with NSF Standard No. 4.

Standard no. 6

The preliminary review of the proposed revision of NSF Standard No. 6 "Dispensing Freezers" was deleted from the agenda of the Joint Committee meeting on the advice of the NSF Staff, as the proposed draft did not appear to reflect the consensus of the NSF Standards Task Committee members.

Standard no. 7

The Joint Committee received a report from the Staff that it was time for the periodic (3 years) review of NSF Standard No. 7 and that the National Sanitation Foundation would soon be establishing an NSF Standards Task Committee for this purpose. The Task Committee will be composed of representatives of public health, users and manufacturers. The committee urges all members of the association to review NSF Standard No. 7 and all of the other Standards and Criteria under consideration and submit their recommendations to this committee.

Standard no. 8

The equipment leg height and portability requirements have been reviewed numerous times during recent years, and specific requirements in this area have been established for most food service equipment. However, as a result of special problems associated with application of Standard No.

8, a NSF Special Task Committee appointed following the 1967 Joint Committee meeting restudied the leg and portability requirements for the Standard and made the following recommendations which were approved by the Joint Committee: *(a) Item 4.112*—(Legs)—The formula for calculating the cleaning access openings below equipment should be deleted, and the specific minimum dimensions for unobstructed space between the floor and equipment should be retained. *(b) Item 4.114*—(Portable)—The unit to be classified as portable must be small and light enough to be easily moved by one person and must have no utility connection or have a connection that can be easily disconnected without tools or have a utility connection of sufficient flexibility and length to permit the unit to be moved or easily tilted by approved mechanical means, for cleaning. *(c) Item 4.115*—(Counter and Table Units)—Equipment other than portable, designed to be placed on counters or tables, shall be sealed to such counters or tables or be mounted on legs of sufficient height to provide a clear 4 inch space between the lowest horizontal member of the unit and the counter or table top, provided, however, where the maximum cleaning distance is less than 3 inches, the clear space shall not be less than 2 inches. The formula for calculating the minimum space between the counter or table top and such equipment was deleted in favor of these specific deminsions.

Vending machine standard

The fourth and final draft of the proposed Standard Relating to Food and Beverage Vending Machines was thoroughly reviewed, and after making several amendments it was approved by the Joint Committee. At the request of this Committee and the other public health committees represented on the Joint Committee, this proposed Standard was developed with the full cooperation of the National Automatic Merchandising Association. It is recognized that the approved purposed Standard does not include all of the recommendations of the Committee nor all of those of the other committees represented on the Joint Committee. Nevertheless, the proposed Standard appears to be a sincere desire on the part of the National Sanitation Foundation and the National Automatic Merchandising Association to coordinate the evaluation requirements of these two organizations and to make them compatible with each other.

General and future projects

A prominent representative of the warewashing machine industry met with the Joint Committee and discussed the background and history relative to the efforts expended by many persons in recent years to initiate and implement the development of a NSF Standard for Pot and Pan Washing Machines. He stated that at least three large user groups of the Federal Government were favorable to the development of such a Standard and that a 100% of the manufacturers of pot and pan washing machines would be willing to participate in the development of such a Standard. He further indicated that a separate Standard should be developed for pot and pan washing machines rather than to include such equipment in Standard No. 3. The public health representatives endorsed the development of a Standard for Pot and Pan Washers and urged the Foundation to pursue same in an expeditious and normal manner.

The NSF Staff reported that an NSF Special Task Committee composed of representatives from the manufacturers, users and public health agencies should have the proposed Standard Relating to Detergent Dispensers and Chemical Feeders for Warewashing Machines ready for review by this and the other participating committees within the next few months.

Members of the Joint Committee and the members of the NSF Staff have received numerous requests during the recent years for the development of a Standard or Criteria on Refrigerated Retail Food Market Equipment. Several meetings with representatives of this industry have been held without creating an active interest on the part of the industry in the development of such uniform specifications. Encouragement was given to the Foundation to continue pursuing ways and means of developing an appropriate NSF Standard or Criteria for this type of equipment in cooperation with industry and public health.

The NSF Staff also reported to the group that progress is being made relative to the development of a Standard on Mobile Food Service Equipment and a Standard on (medium, low and high pressure) Plastic Laminated Coatings; and a final working draft relating to Plastic Laminated Coatings reportedly should be available for review by the Committee in the Fall of 1968.

It was reported that a Special Task Committee concerned with the development of a Standard or Criteria for Ventilation of Food Service Equipment was still active and should soon have a report for review by this Committee. However, the Special Task Committee concerned with the development of a Standard for Dinnerware has not been active due to the lack of interest on the part of manufacturers of such ware.

NATIONAL AUTOMATIC MERCHANDISING ASSOCIATION (NAMA)

The National Automatic Merchandising Association's Automatic Merchandising Health-Industry Council (AMHIC) held its twelfth annual meeting during October, 1967, and this association and other public health organizations and the affected industries were represented and participated in AMHIC's discussions.

The afternoon of the first day was reserved solely for a meeting of the public health representatives and was used by them to discuss and clarify their view on public health objectives and policies to be followed in their work with the entire membership of AMHIC. The Chairman of IAMFES Food Equipment Committee was re-elected Chairman of the public health group and also served as Co-Chairman of AMHIC during 1967-1968.

The evaluation manual

Section 200 (Smooth): The definition smooth was amended to require food contact surfaces to have a finish and cleanability equal to Number 2 B, 3 or higher mill finish on stainless steel.

Section 304.1 (Design Options in the Section on Cabinet Elevation and Movability): Item (3), formerly Item (1) concerned only with leg height was amended as follows to provide also for side panels: (3) Machines may be mounted on legs or continuous side panels which create an unobstructed space of at least 6" between the floor and the bottom of the machine, or any component of the machine except for the side panels or legs.

Section 304.2 (Legs, Feet and Levelers): The last two sentences of this section were rewritten as follows: Where L-shaped legs are used, the internal angle must be closed. Feet and levelers must be of simple design, shaped and attached to the leg or side panel so as to permit cleaning. There must be no exposed threads on feet of levelers at any

normal adjustment position. Maximum leg leveler extensions must not exceed 0.75 inch.

Section 304.3 (Side Panels). This is a new subsection: Where the bottom of the side panel is turned inward to form a channel, such channel must be not more than 2 inches in width and must be closed.

Approval and periodic review of manual

The *Evaluation Manual,* as amended at this meeting, was approved as a final document by the members of AMHIC. The members of the Council further decided that the manual would be reviewed by the Subcommittee on Manual Revision every three years, and there would be no changes in the manual during that period of time except for major or emergency items arising in the interim.

Manual changes—implementation

The Council further decided that changes in the machine design or construction requirements of the *Evaluation Manual* would become effective immediately in the case of new machine models submitted for the first time, and would become effective at the time of the next scheduled reevaluation, but not sooner than one year, in the case of machine models which were already approved or in the process of evaluation at the time of such Manual change.

Ice-makers

An Ice-maker Subcommittee has been working several years gathering data on ice-makers to determine the public health significance of these machines. This committee has developed a proposed Ice-maker Research Test Protocol for the purpose of finding an answer to this question.

Observations and reports to date seem to indicate that: *(a)* icemakers are prone to the build-up of materials thought to be slime-type molds or bacteria, insoluble solids—or both; *(b)* such build-ups develop over relatively short or long periods of time, depending apparently upon local water quality and the continuous vs. intermittent use of each machine; and *(c)* no information is available concerning the effectiveness of presently recommended (by manufacturers) methods of in-place cleaning.

It has been suspected that the retention of melted ice water in the ice-maker system may be contributing to this build-up of objectionable substance. To eleminate the re-freezing of meltwater and to increase total water flow through the system, which is believed to be effective in reducing such build-ups, manufacturers of ice-makers for the vending industry have variously disposed of meltwater by evaporation or via the machine waste pail. Both methods have serious operational drawbacks. More recently, the use of meltwater for production of carbonated water has been initiated. This method seems to have a beneficial effect and to warrant study.

There have been two theories of ice-maker cleaning—one favoring in-place methods and the other favoring easy disassembly of the unit in the field or field cleaning and maintenance. While field disassembly is less desirable than in-place cleaning (if equivalent results can be obtained) there has been no study made to determine the effectiveness of in-place cleaning. Neither is there a concensus on the ease of disassembly which may be desired for shop cleaning purposes.

In order that ice-maker manufacturers may have a better guideline for design and construction, and so that the NAMA can have a better basis for instructing operators in the proper maintenance of ice-makers, a series of studies have been proposed; and the results of these studies will be reported as soon as they are finished, reviewed by the Council, and approved for dissemination by NAMA.

Evaluation Program for Other-Than-New Vending Machines

The purchase and resale of other-than-new vending machines is a growing activity within the vending industry. In some instances, the machine is resold without any appreciable cleaning or reworking. In others, the degree of reworking may range from nominal to complete.

Many such machines are shipped interstate, making it difficult or impossible for operators and public health and military officials to determine independently the nature and extent of changes which may have been made to the machines by the reseller.

The proposed NAMA Evaluation Program for Other-Than New Food and Beverage Vending Machines is being developed for the following purposes: *(a)* to establish minimum sanitation and public health criteria for machine reworking operations; *(b)* to provide a program of testing and certification to those companies who wish to conform to established public health standards in their machine reworking operations; and *(c)* to provide a means whereby buyers and public health or military officials can identify machines which have been reworked by standardized procedures to meet public health requirements.

The Subcommittee on Evaluation Program of Other-Than-New Vending Machines have developed five drafts of a proposal for evaluating such machines, and these have been reviewed by this Committee. A final draft should be ready for review and approval at the 1968 meeting of AMHIC.

Cut-Off Controls for Machines Vending Potentially Hazardous Foods

A Subcommittee on Cut-Off Controls for Vending Machines was appointed and given the following charge: *(a)* to investigate the effectiveness of present (health) controls in performing the job assigned by the Public Health Service Code and by the *Evaluation Manual; (b)* to determine if a satisfactory field test for working controls is available to the sanitarian; and *(c)* to recommend to AMHIC any amendments to the Manual which the investigations reveal to be needed.

This Subcommittee including the only manufacturer of such controls has met at least once during the past year. At this meeting, plans were made to develop evaluation procedures and forms and to evaluate controls on 30-40 machines in the field under various conditions of normal usage. Plans were also initiated to develop educational materials which would aid in implementing the correct installation of these important health controls from a functionability as well as an accessibility, for field testing, aspect. Results of these plans should be available for review by this committee within the next few months.

Other Educational Materials

An informative and interesting piece of literature developed in cooperation with the members of AMHIC should prove of interest to the general public and to the members of industry and public health. This publications, *20 Answers to Questions About the NAMA Vending Machines Evaluation Program,* may be obtained from NAMA.

RECOMMENDATIONS

1. The Association reaffirm its support of the National Sanitation Foundation and the National Automatic Merchandising Association and continue to work with these two organizations in developing acceptable standards and educational materials for the food industry and public health.

2. The Association urge all sanitarians to obtain a complete

set of the National Sanitation Foundation's *Food Equipment Standards and Criteria* and a copy of the National Automatic Merchandising Association-Automatic Merchandising Health-Industry Council's *Vending Machine Evaluation Manual;* to evaluate each piece of food equipment and vending machine in the field to determine compliance with the applicable sanitation guidelines; and to let the appropriate agency know of any manufacturer, installer, or operator failing to comply with these guidelines.

3. The Association urge all sanitarians and regulatory agencies to support the work of the Association's Committee, and subscribe, by law or administrative policy, to the principles represented by the Standards, Criteria, and *Evaluation Manual* for food equipment and vending machines.

KARL K. JONES, *Chairman*, Purdue University, West Lafayette, Indiana.

IRVING L. BELL, State Department of Health, Frankfort, Kentucky.

CARL HENDERSON, New Mexico Department of Public Health, Santa Fe, New Mexico.

LLOYD W. REGIER, Fisheries Research Board, Halifax, Nova Scotia, Canada.

A. T. RHOADS, National Canners Association, Washington, D. C.

JEROME SCHOENBERGER, City Department of Health, New York, New York.

HAROLD WAINESS, Harold Wainess and Associates, Chicago, Illinois.

REPORT OF THE COMMITTEE ON EDUCATION AND PROFESSIONAL DEVELOPMENT, 1967-1968

The objectives of this committee are to explore ways to improve education of sanitarians at the undergraduate, graduate and field levels; to implement methods for attraction of persons into the environmental health field; to develop educational tools for use of sanitarians, both in their public contact work and in in-service training; and to enhance the image of the professional sanitarian in the eyes of the public as well as among his employer and fellow employees.

For some time there has been a shortage of color slides suitable for orientation of new sanitarians in bottling plant inspection. A subcommittee explored the problem this year and undertook the preparation of a silde series that will meet this need. This project was initiated with the cooperation of Coca-Cola Bottling Company. After a period of field testing, the slide series will be submitted to the Executive Board of IAMFES for approval so the slides can be made available for preview and sale to anyone desiring them. The subcommittee has also undertaken the preparation of a teaching guide to accompany the slides. Sanitarian journals have been devoid of articles on bottling plant inspection, so one member of the subcommittee is preparing an article for the *Journal of Milk and Food Technology* on this subject.

The image of the sanitarian and his supportive staff may be impaired in the community if good telephone manners are not utilized. With the view in mind of aiding our members in improving their telephone image, suggestions were sought in meetings held with training directors of a Bell System affiliate. The conclusion reached was that our members will be encouraged to seek assistance from traffic service advisers in their nearest Bell office. In most instances these specialists will be able to give talks and show films at our annual meetings or to groups in offices where we are employed. Persons who are not in an area served by the Bell System may, in most instances, borrow the films from the nearest Bell affiliate. Films selected as appropriate for showing to sanitarians and their staffs, in order of preference, are: "The Extra Step," "A Manner of Speaking," and "If An Elephant Answers." Each film is 16 mm sound and is in color. Printed Bell handouts which are suggested for audiences seeing these films are: "Win More Friends by Telephone," "Dialing Tips," "Elmer Never Forgets," and "Tips for Succeeding in Business—by Telephone."

Several colleges are anticipating inclusion of courses in their curricula which will lead to a B.S. degree in Environmental Sanitation. At the request of the President of IAMFES, the committee outlined a suggested four-year undergraduate program for colleges that desire to prepare persons for the career of sanitarian. This outline, in mimeograph form, is being made available by the committee to anyone who desires it.

The Public Health Service this year released a draft of a manual on housing inspection. This book is designed to orient persons employed in the health field in the fundamentals of housing inspection. The draft was reviewed by one of our subcommittees and comments were forwarded to the Public Health Service.

Few sanitarians have adequate or a sufficient number of educational leaflets for use in their daily work. It was the concensus of the committee that they could start bridging this gap by providing master copies of flyers or leaflets to agriculture and health departments. From the masters the departments could have plates made and the literature printed by the offset method at a very reasonable cost. Since the master would not be copyrighted, each department could have its name and address imprinted on the copies. The first one-page flyer produced this year by the committee is on pests in the home, and master copies have been mailed to several departments. The average cost of printing this flyer is $42 for 7,000 copies. The committee does not believe that IAMFES should stock these leaflets, as costs and mailing could present formidable problems. It is believed that better control and more satisfaction will be derived from departments having copies printed to their specifications from free masters which we would provide.

To the best of our knowledge a brochure is not now available which is designed to attract college students into the field of dairy products inspection. The committee has discussed the need for a brochure of this type and would like to undertake such a project in the ensuing year.

Sanitarians are sometimes asked to give talks to civic groups on the story of milk from the cow to the consumer. Although certain 16 mm films are available to tell this story, there are times when the speaker would prefer slides as visual aids. One member of this committee is working on a set of master slides which, after completion, will be presented to the Executive Board for approval. Arrangements would then be made to make the series available on a cost basis to persons who need this type of visual aid.

A subcommittee feels that another series of slides is needed to aid sanitarians who give talks to civic groups on activities of the sanitarian. Where possible, such slides should be made by the sanitarian in his own locality. However, there are instances where local departments lack the equipment or knowledge to produce satisfactory slides. The subcommittee plans during the next year to prepare a slide series that would meet the needs of this group.

A pilot project was planned and started in Virginia concerning production and distribution of sanitation and safety posters in food establishments. When the pilot demonstration has been concluded, health departments and certain agriculture departments across the nation will be encouraged to produce copies of the pilot posters and post them in food establishments under their surveillance.

This year the committee was in receipt of 83 inquiries about the professional sanitarian. Fifty-four of these letters came from high school students, 5 from college students, 16 from guidance counselors, 5 from libraries, 2 from publishers, and 1 from a person in military service. In addition, 2 college seniors inquired about the locations of vacant sanitarian positions.

One committee member prepared and sent an article to *Institutions* magazine on the use of educational television in training food service personnel.

As the fiscal year ended, a subcommittee reported that a series of slides for use by sanitarians in training food service personnel in restaurants was now complete. A plan will be worked out to make these slides available on a cost basis to persons who desire them.

The committee was fortunate in obtaining certain favors for distribution to IAMFES members in attendance at the annual meeting in St. Louis. We are grateful to Clark Gum Company and Phillip Morris, Incorporated for these favors.

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PAUL HANGER RECEIVES P. E. RILEY AWARD AT ASSOCIATED ILLINOIS MILK SANITARIANS MEETING

Paul Hanger was born in Logan County, Illinois in 1910 and his family later moved to Urbana where he completed his education with a B.S. Degree in 1917. He was in Industry for a time and then came with the Department in November of 1937. During this time with the Department, he was involved in many programs, establishing many of the procedures and programs that are presently operating in the State. Two individual awards that are deserving of mention are: (1) in 1966 Paul was awarded a special citation for his untiring efforts in drafting and passing the Bulk Milk Tank Operators Law by the Illinois Public Health Association and, (2) the P. E. Riley Award, which is given to some public health personnel in the State each year for the most outstanding achievements, during their career for the promotion of the milk program. Along with this, Paul has served very faithfully on the Standard Methods Committees and has been very active in the Associated Illinois Milk Sanitarians organization, being President of the State organization in 1957. Paul is retired as of June 30 this year.

DAIRY FARM METHODS COMMITTEE—DETAILED REPORT, 1967-1968

ANTIBIOTICS, PESTICIDES, AND OTHER ADULTERANTS

D. K. Summers — Chairman

Antibiotics

Since the early 1940's to the present, the dairy industry and milk control officials have been greatly concerned about the widespread and, in many instances, indiscriminate use of antibiotics for the treatment of cows with udder infections.

Recent estimates in the amount of antibiotic-type drugs used each year for the treatment of mastitis alone are placed at well over 95 tons. Information received from the committee members and from the reviews of recent studies indicates that most infected cows are treated by intramammary infusions; however, intravenous and intermuscular injections are also used extensively.

Penicillin generally is the type of antibiotic used in mastitis treatment although other antibiotics such as bacitracin, streptomycin, tetracycline, neomycin, erythromycin, to name a few, are also widely used. Sulfa type drugs, as sulfanamides, are used to a lesser degree.

Milk containing antibiotics is not considered to be acceptable as a food for human consumption, particularly since it is associated with milk from unhealthy animals and since there is an increasing number of people who have developed proven sensitivity when they consume relatively low concentrations of certain types of antibiotics. Also, most regulatory agencies consider milk to be adulterated if it contains detectable amounts of any type of antibiotics.

With the advent of a nationwide program for the control of abnormal milk, this program gives particular emphasis to the control of mastitis. This emphasis has been associated with a growing trend in several areas of the country to attempt to control mastitis by indiscriminate and improper use of intramammary infusions before any attempt has been made to apply a thorough diagnosis of the illness associated with the animal. The practice of indiscriminate use of antibiotics by many dairymen apparently stems from the fact that this is the easiest control measure to apply; however, it has been clearly shown that antibiotic treatment for mastitis is only a part of the total milking management program that must be considered by the dairyman for his individual situation.

Since there are potential health hazards associated with feeding of antibiotics to food producing animals, particularly dairy cows, the Food and Drug Administration, in 1968, announced that its Control Division would regulate more closely the medicated feeding of food-producing animals. These provisions were set forth in the April, 1968 issue of the *Federal Register* and stated, in part, that drug manufacturers and others must submit data that establishes whether or not such antibiotics and their metabolites are present as residues in milk, edible tissues, and eggs from the treated animals. The Food and Drug Administration provisions further state that because of the accumulation of new information regarding the development of bacteria resistant to antibiotics, the ability of bacteria to transfer this resistance, and the development of hypersensitivity to antibiotics, they cannot be permitted in food obtained from animals so treated.

The dairy product manufacturers, particularly those associated with production of starters, cheese, cottage cheese, and yogurt have, in the past and at the present time, experienced considerable difficulty in obtaining acceptable flavors, standardized acid production, and proper developing of these products because of the presence of antibiotics even in relatively low concentrations.

Also, the regulatory agencies, educational groups, and the dairy industry have demonstrated considerable progress in the curtailment of antibiotics from the nation's milk supply. It is this committee's recommendations that re-emphasis be given to the following control criteria to assist in the continual reduction and possible elimination of antibiotics from all milk supplies: *(a)* All States and the Federal government provide comprehensive educational and training programs for dairymen, dispensers of antibiotics, veterinarians, sanitarians, and related groups on the elimination of antibiotics from milk supplies. Emphasis should also be placed on problems relating to medicated feeding of dairy cows. *(b)* Require all antibiotics for use in the treatment of dairy cows to only be obtained through prescriptions. *(c)* Accelerate the development of more sensitive laboratory and field testing methods and equipment. *(d)* Provide effective interstate and intrastate legislative controls on the sale and distribution of milk containing antibiotic residues. Further controls should be established on a nationwide basis to limit the dose rate of antibiotics, particularly with respect to intermuscular and intravenous feeding. *(e)* Oil- base antibiotics should not be used or be considered acceptable for use in the treatment of dairy animals.

Pesticides

Pesticide compounds are being produced and used in ever-increasing quantities and in constantly widening applications; consequently, the probability of milk and other foods being contaminated by these chemicals, either directly or indirectly, becomes more probable throughout the nation.

Pesticide chemicals that are available and of concern to the milk and food industry include insecticides, rodenticides, fungicides, herbicides, repellents, attractants, nematocides, plant regulators, defoliants, and many others—all of which may be placed in the broad classifications of chlorinated hydrocarbons, organic phosphates, carbamates, arsenicals, organic mercury compounds, bromines, and others.

It has been recently reported by the chemical industry that over one billion dollars are spent annually on pesticide chemicals with 47% of the total for insecticides, 44% for herbicides, and 9% for funguscides. It was further reported that there has been a continual and accelerated increase in the production and use of all classes of pesticides within the last 15-year period with the greatest increase shown in the past 6 years, particularly for agricultural activities relating directly to food of the "ready-to-eat" classification.

In view of the ever-increasing use of pesticides, a demand has forcibly been made by some States and the Federal government for establishment of adequate and effective controls to protect the consuming public.

All food for human consumption and animal feeds, including many of the imported foods and ingredients, can be considered to be contaminated to a greater or lesser degree with one or more pesticides. As regards to the nation's milk

supplies, the residual that may be present in milk usually results from direct animal contact by the ingestion of pesticides in the animals' water and feeds and the direct application of the pesticides onto the cows or their housing and stabling areas, as well as the contamination of milk during production, transportation, or processing.

The findings of this committee indicate that during 1967 and a part of 1968, most of the State and local regulatory agencies and the dairy industry were periodically conducting analytical determinations of pesticides in their milk supplies. Also, they are updating, when necessary, their analytical procedures to conform with recommended methods. The total number of milk samples collected and the results of the tests made by States could not be obtained; however, the Federal Food and Drug Administration reports their findings, which are based on the past 3 year period of over 16,000 tests of milk and dairy products, to be as follows: DDT, DDE, dieldrin, heptachlor expoxide, TDE, BHC, lindane, aldrin, heptachlor, and methoxychlor accounted for 99% of the chlorinated residual found and with more than 20 other chemicals reported in one or more of the total samples tested. A substantial majority, 99%, of the samples were below 0.5 ppm on a fat basis and 71.5% were below 0.11 ppm on a fat basis.

The tolerances established by the FDA in 1967 for DDT and its analogues singularly or combined were set at levels of 0.05 ppm in fluid milk and 1.25 ppm in the fat of other dairy products. It was further reported by the FDA that the nationwide pesticide residual in milk and milk products does not, at this time, present a major problem. It was found, however, that a number of individual areas in some of the States reported high pesticide residuals during the 1967 and 1968 period.

Efforts are continued by research laboratories on the development of methods and procedures for the removal of pesticides from milk and milk products. Information received from the University of Wisconsin indicates that one of their research projects on the removal of chlorinated hydrocarbons from milk shows promise by applying ultraviolet rays to the milk flowing over a surface cooler and resulted in the removal of over 30% of the methoxychlor and 1% of DDT; other pesticides were also removed at a lesser rate. Pennsylvania State University research personnel were also able to remove a portion of dieldrin and heptachlor epoxide from milk fat by the use of low pressure steam distillation during 5 hr treatments. The long-term storage of dairy products, particularly cheese and butter, has not resulted in the reduction of the pesticide contaminated products.

The recommendations set forth by the Task Committee members and others for nationwide control of pesticides in milk and other dairy products are essentially the same as set forth in the 1967 report which are as follows: *(a)* A comprehensive law or regulation governing the registration and sale of insecticides, rodenticides, and herbicides should be adopted by each State. *(b)* All private and commercial applicators should be licensed by the States. (A provision for the periodic re-evaluation of their methods should be included in the licensing requirements.) *(c)* Feed crops (hay and grain) to be consumed by dairy animals should be permitted to be sold only if such feed supplies comply with acceptable tolerance levels. *(d)* Prohibit the use of chlorinated hydrocarbon pesticides if residues cannot be controlled by other means. *(e)* Prohibit the sale of dairy cows or heifers that have been exposed to pesticide contaminated feeds above permissible tolerances.

Most investigators of the pesticide problem including States, Federal government, research groups, and educational institutions conclude that at the present time the amount of pesticide residuals in our milk supplies are not at a dangerous or alarming level; however, these levels should not be permitted to increase, all-out surveillance programs be established should none exist, and all existing programs be accelerated where necessary to afford positive control of pesticides for the safety of the consuming public.

Other adulterants

It was reported that most milk control agencies are applying the FDA definitions of adulteration as it relates specifically to milk and milk products. Such products, when considered to be adulterated, are impounded, destroyed when necessary, and warnings or charges preferred against those who have been responsible for the adulterations of the products. Information presented by the committee members indicates that the majority of the milk enforcement agencies' testing programs for adulteration are directed principally to the determination of added water and that very few tests are conducted to show the possible presence of other adulterants as detergents, sanitizers, or other chemical agents.

Regarding the testing program for added water, it was indicated by a number of agencies that they were using freezing point determinations; and all test results above −0.534 C have been considered by most enforcement agencies to be from samples of adulterated milk. It was also reported by one agency that during a 3 year testing period, several individual producers and an entire milk plant supply were found not to be meeting the freezing point standards with the results the milk was excluded from the market. To correct these conditions, emphasis was placed on collection and care of test samples, standardization of testing procedures, and calibration of cryoscopes with accurate standardization solutions. Results indicated considerable improvement in the entire sampling and testing program. It was readily noted that most milk producers and dairy plant personnel are now well aware of the problems involved and are exerting greater care in seeing that all milk moving equipment is completely drained of water as well as detergents and sanitizing solutions. Another agency advised that prior to instituting a complete sampling and testing program for added water, 10 to 12 producer dairies each year were suspended from the market; however, after the testing program was started, the percentage of producer suspensions is now well under 0.01%.

The committee members reporting on the possible adulteration of milk and milk products by sanitizers, detergents, and other chemicals advise that it is their impression that a large number of the regulatory agencies and the dairy industry in this country are not fully aware of the possible problem associated with detergents or sanitizers in milk and are not providing proper surveillance of this problem. Also, some control agencies have expressed concern with the build-up of iodine-type sanitizers in pipelines and other milk equipment, although they have not studied this problem in depth. Addtional groups have indicated that they believe greater surveillance in this area is greatly needed since at times their milk supply samples do not show growth when tested for bacterial numbers and the antibiotic tests show negative results. It was generally agreed that there may be other types of adulterants in a milk supply that prohibit normal growth of bacteria, and complete studies in this area are needed. Also, with the increased use of automatic pipeline and cleaning systems and the use of many different types of chemical

agents, all control officials and the dairy industry should give greater emphasis to the establishment of periodic surveillance and testing programs for the possible adulteration of milk by these chemicals.

CIP CLEANING AND SANITIZING OF DAIRY FARM EQUIPMENT

RICHARD RINTELMANN—Chairman

The original charge of this committee was to review the CIP cleaning and sanitizing of dairy farm equipment. This original charge did not include application of this subject to farm bulk milk pickup tanks or over-the-road tankers. Certain aspects of the latter subject, however, did turn up during the investigation and this material can be forwarded to the appropriate committee for review.

The committee strongly recommends the use of the CIP procedures and equipment for all dairy farm milking equipment with special reference to the farm bulk tank. In the area of mechanical cleaning of farm bulk tanks, the following problems and areas and ideas were brought to the front: *(a)* It is the general concensus of opinion of the committee members that it would be advantageous to permanently install spray-balls or spray-sticks in farm bulk tanks. These spray devices, however, should be designed for ease of disassembly for removal of any foreign matter buildup. It would appear that the installation and the design of these spray devices should have 3-A reference. *(b)* Some of the CIP equipment presently on the market for cleaning and sanitizing farm bulk tanks is not of proper design. An example of this is the agitator shaft-type spray system which is not self-cleaning and the lower portion of the agitator shaft cannot be cleaned manually or by CIP. *(c)* Bulk tank agitators are improperly cleaned because they are not in operation during the washing cycle. It was suggested that the agitator be wired directly into the CIP system which would automatically turn on when the system is activated. *(d)* Manufacturers should simplify CIP equipment and its operation and make sure that all of the contact parts are of acceptable materials. *(e)* The sanitizing procedure after automatic washing, but prior to milking is sadly neglected. The CIP equipment should incorporate automatic sanitizing or it should be done by spraying with a proportioning device. *(f)* The responsibility for proper cleaning and sanitizing of the farm bulk tank—even under CIP conditions—should be the sole responsibility of the individual producer and not of other personnel such as the bulk tank driver. *(g)* CIP systems should be considered an adjunct to cleaning and all parts cleaned automatically or mechanically brush-washed. All outlet valves of bulk tanks must be completely dismantled and hand-brushed each time the tank is emptied. *(h)* We need continued and intensified educational efforts with dealers regarding the proper location and installation of CIP equipment.

Various facets of CIP pipeline systems were reviewed and discussed. The following applies: *(a)* Vacuum stand pipe pipeline systems should be eliminated because they will not CIP properly. *(b)* Milk nipples on the milkline should be properly installed to achieve proper washing and draining. Those milk inlets that are properly installed but do not seem to be of proper design should be brush-washed. Particular attention should be given to capping and the care of the caps themselves. *(c)* Electrodes and releaser jars cause problems in the area of cleanability. It would appear that these problems are primarily related to the type of material used in manufacture rather than the CIP procedure. A further investigation of this problem should also be made in the area of releaser jar design, possible electrolysis, and improper use dilution of the wash solution. *(d)* Cleaning problems in pipelines from releaser to the tank can be related to installation; air leaks; and more important, proper time, temperature, use dilution ratio. *(e)* The Task Committee should make further study and recommendation regarding both time and temperature. The majority of the committee members presently feel that the 20 min wash cycle is too long and that 10 min seems to be most acceptable. There is also a wide variation in temperature requirements of various wash and rinse solutions and their effectiveness. Booster heaters and the possibility of maintaining temperatures should be discussed and recommendations made. *(f)* The Task Committee on CIP cleaning defers to the Task Committee on Adulterants adulterations in the milk supply as they possibly relate to wash solutions, water, and sanitizing solutions particularly in pipeline and transfer system operations. Emphasis should be placed on producer education. *(g)* The committee unanimously agrees that producers should be discouraged from the use of household bleach or household detergents for any milk equipment application. *(h)* The committee recommends that further investigation be made regarding water, water problems, and the water analysis situation. Guidelines and recommendations can be developed regarding this total matter. *(i)* The committee dealt with the possible problems in the use of liquid sodium hypochlorites for sanitizing. It is the concensus of opinion that when properly used there is no problem in the area of corrosion. Water supplies that contain troublesome quantities of iron can be so treated or conditioned to eliminate this problem. Stability and loss of strength seemed to be a problem, but the committee majority felt that governmental agencies will make recommendations in this regard in the near future. *(j)* Most committee members felt that we should use caution regarding establishment of installation guidelines and concentrate on those factors relating to the operation of said equipment and to its cleanability.

EDUCATION

VERNON NICKEL, Chairman

The Educational Sub-committee has the continual process of gathering new material for publication in the Journal which is forwarded to Mr. William J. Dixon, Associate Editor of the *Journal of Milk and Food Technology*. Mr. Dixon will abstract the material for publication.

Material comes in from many areas and we hope it continues to arrive. At the present rate, we will be able to keep our membership continually supplied with the availability of new up-to-date dairy material of interest to all who have worked, and are still working, to gather the material.

PLASTICS

BERNARD SAFFIAN, Chairman

In the past number of years, plastics of many generic types have been promoted for use in many applications of dairy farms. In 1965, a final report was submitted which covered recommendations for handling flexible lines. During 1966-1967, an initial survey was made to cover other applications of plastics on dairy farms. This survey named the applica-

TABLE 1. SURVEY ON PLASTICS APPLICATIONS ON FARMS MADE DURING 1967-1968. MATERIALS IDENTIFIED AND PERFORMANCE NOTED

Product	Type of Plastic	Remarks and Suggestions for Improvement
Rigid Pipelines	Polycarbonate	High degree of expansion with temperature variation
Dairy Brushes	Nylon	Good cleaning job
	Alginate	Maximum use temperature is 130 F, and will not resist acid
	Polypropylene	Good—resists acid and hot water—gives long life
Wash basin, hand	Alginate	Poor—short life
Washing pail	Alginate	Fair—light in weight—does not mar stainless steel equipment when in contact
Ball check valve for dumping station	Rigid PVC	OK
Stall cocks	Rigid PVC & ABS	OK
Water lines	Rigid PVC	OK—in cold climate may freeze and be difficult to thaw unless a single heavy wire is placed in tube at time of installation.
Filter pad boxes	Polystyrene	OK
Transfer hose from tank to truck	Flexible PVC	OK—if plastic meets 3-A Standards—multiple use and cleaned properly
Gaskets	Fluorocarbon	OK
Air cocks on vacuum lines	ABS	OK
Claw parts	Rigid PVC, Acetal	OK
Black vacuum line	Flexible PVC	OK
Clear transfer lines	Flexible PVC	OK—if plastic meets 3-A Standards—multiple use and cleaned properly
Milking machine sight glass	Styrene-acrylonitrile	OK
Pipeline inlet valve	Polycarbonate	OK
Vacuum regulator	Fluorocarbon	OK
Pipeline couplings—for glass pipe	ABS	Good if not tightened excessively
Pulsator body and valve	Fluorocarbon	Lubrication
Moisture traps	Polythylene	Slight Discoloration
Milk Line	Polythylene	Must be taken apart for inspection
Inflation shells	Polycarbonate	OK
Milker unit	Polycarbonate, Styrene-acrylonitrile	OK
C.I.P. pipeline washer	Acrylic	Fair—crazing occurs with age—use annealed polycarbonate
Pulsator cylinders	Nylon	OK
Pulsator housing and rotor	Acetal	OK

tion, generic type of plastic, and observations on performance of the plastic item. A report was submitted in 1967 covering this survey.

This committee was continued to search out new applications and to answer the questions which were incompletely considered in the 1966-1967 report. To date, there are 50 plastic items which have been identified, with probably more which are in use at this writing. It will be appreciated if information is received from anyone reading this report, regardless of whether or not they are members of the Plastics Task Committee.

It appears that when failure of an item occurred, either the choice of plastic was incorrect, the design of the item was not optimum, or an improper cleaning procedure was used. Improvements in performance of some items were noted where the choice of plastic was upgraded.

Recent finding have shown that for cleaning flexible vinyl milk lines or other flexible vinyl parts, cleaners should be used which do not contain caustic soda. Caustic soda causes cracking, crazing, and etching of the vinyl surface. The same

applies to polycarbonate parts which quickly show cracking and/or dissolving when in contact with concentrated caustic soda or in longer periods of time when alkaline cleans containing caustic soda are used.

SEDIMENT

ELMER KIHLSTRUM, Chairman

There must be an improvement in the quality of milk produced on the farm. Programs must be initiated to improve taste and quality of milk. It has been reported that one of 4 qt. of milk will fail the taste test. The dairy industry has nothing to sell until we have a dependable supply of high quality milk.

First on every dairy farm there must be new emphasis on the production of high quality milk. Surveys show 20% or more of the market milk has recognizable off flavor. The consumer who has just used some milk with an off flavor switches more easily to a milk substitute than the consumer who regularly gets good milk.

Pennsylvania survey shows a big need to up-grade milk quality. A 9 month survey, covering more than 75 stores throughout Pennsylvania last year indicates that additional effort is needed to up-grade the quality of fluid milk—beginning at the farm and continuing to the dairy case and consumer's door-step. Flavor judgment showed 36.7% of the samples good, 49.5% fair, and 13.8% poor. A comparison by the Pennsylvania dairy scientists showed their findings generally agree with similar studies conducted in other areas of the United States. The technologists found many of the off flavors to be of farm origin—feed, unclean, and rancid flavors constituted 59% of the total.

In the February, 1966 issue of the *Modern Milk Hauler,* an article indicates that sediment is called the No. 2 problem facing the dairy industry today. With more pipelines and bulk tanks, proper cleaning of the cows is even more important. Sediment tests are taken regularly on can milk and with milk for manufacturing purposes and rejected regularly if not up to standards. However, milk in the bulk tank may or may not be tested for sediment and rejects, if any, are limited even if the milk is not up to standard. The sediment test is one test the dairyman understands and tests for sediment should be made on all milk on a regular basis as described in *Standard Methods.*

TABLE 2. SURVEY ON PLASTICS APPLICATIONS ON FARMS MADE DURING 1967-1968. MATERIALS NOT IDENTIFIED AND/OR PERFORMANCE NOT NOTED

Product	Type of Plastic	Remarks and Suggestions for Improvement
Manhole cover on tank truck	?	Much breakage
Cover for milk carrying pail & strainer	?	Unsatisfactory
Unions and elbows	Rigid PVC (?)	?
Milk meters	?	Air leaks, non-CIP
Shut off stem in milking head	?	Rough edges
Valve outlet cap on pipeline milker	?	?
O-rings	?	?
Hose	Nylon Fluorocarbon	? ?
Bulk tank manhole cover	Acrylic	?
CIP test cup washer	?	Crazing occurs
Pipeline hanger clamps	?	?
Float valve	?	Cracking
Milk weighing device	Polycarbonate	?
Rigid vacuum lines	?	?
Milk pump impellers	?	?
Cleaning proportioning devices and chlorinators	Acrylic, Acetal, Chlorinated polyethylene	? ?
Milk sample containers bottles, pipettes, bags)	?	?
Air lines	?	?
Hose connections for automatic bulk tank cleaning	?	?
Filter holder	Polycarbonate	?

COMPATIBILITY OF DETERGENTS TO FARM WATER SUPPLIES AND EFFECT OF SOLUTION TEMPERATURE ON CIP CLEANING OF FARM EQUIPMENT

STEPHEN B. SPENCER, Chairman

A potable water supply far from assures the water is satisfactory for use in washing milk handling equipment. Additional water conditions must be considered in the choice of a compatible detergent for farm equipment cleaning. Water problems and corrective treatment are suggested in the accompanying table. The committee proposes to conduct field studies of solution temperature in relation to CIP cleaning.

RELATION OF FARM WATER SUPPLIES TO THE QUALITY OF MILK

HENRY ATHERTON, Chairman

Information received from subcommittee members indicates little new activity in the evaluation of farm water supplies as they affect milk quality. On the other hand, repetition of problems discussed in past reports emphasizes that these problems still exist and that more people are becoming aware of the validity of this concern.

As indicated in last year's report, the Federal Water Pollution Control Administration of the U. S. Department of Interior has taken action to establish water quality standards for much of our nation's water systems. While it is fair to indicate that important advances have been made, there still remains a lot to be done before the water supplies, including those used in the production of milk, are protected from all of the contaminants of our society. Unfortunately, neither industry nor government has been able to progress as fast as would be desirable because of present financial commitments, both public and private.

There is evidence that water supplies are being contaminated by chemicals and bacteria from feed lots and liquid manure disposal systems. At the moment, the main concern is that such waters lose their aesthetic appeal and will not be acceptable, based on state requirements for water pollution control. The extent of such pollution should be determined as well as its effect on milk quality.

The results of one study showed that high coliform counts in raw milk were associated with the rinsing of bulk tanks with untreated water. It was determined also that farm water supplies could be a significant source of psychrophilic organisms when such supplies are used for rinsing milking equipment. Reports continue to be received of milk contamination resulting from the failure to drain and dry pumps and pipelines. Often contamination in this manner is sufficient to affect the freezing point of the milk supply. When such water is taken from an unprotected source, the resulting milk supply may contain psychrophiles, coliforms, yeasts, and other spoilage organisms. This produces a serious decline in raw milk storage-ability.

Information from the field suggests there is a growing awareness of the need for water testing procedures as a basis for establishing suitable sanitation programs. It would appear that the fieldmen and sanitarians recognize that some properly protected water supplies may need bactericidal treatment and that water treatment may be desirable to remove mineral contaminants prior to use of the supply in the milkhouse or farm home. The use of ultraviolet treatment to control microorganisms capable of surviving usual chlorination exposure is mentioned with increasing frequency.

Very little research pertaining to the effect of water quality on milk quality has been reported to your committee. Toan and associates at Kansas State University [*Journal of Dairy Science*, 48:1174-1178 (1965)] found that *Aerobacter aerogenes* was "the causative organism in samples of commercial milk having defects described as cowy or feedy, or both."

Morton Salt Company prepared a useful guide for presenting information on water and water conditioning to Home Economics students. This training aid might have application in presenting such information to milk producers. The Water Conditioning Association International of Wheaton, Illinois has several publications of interest in describing the value of soft water. These include a single sheet titled "Soft Water Aids Dairy Farm" and a 15 page discussion of "Solving Water Quality Problems on the Farm."

Many states are working on water quality standards to satisfy local responsibility under the Department of Interior's Federal Water Pollution Control Administration. The dairy industry, like other major water users, will need to determine what is necessary to assure that future water sources do not contribute to milk quality problems. It is unfortunate that there is so little research activity in progress to assess the role of farm water supplies on future milk quality.

DAIRY FARM MANAGEMENT

WILLIAM L. ARLEDGE, Chairman

The Dairy Farm Management Sub-Committee was formed by combining the sub-committees on Relation of Dairy Cattle Housing to Quality Milk Production and Dairy Farm Milk Management. The new sub-committee's assignment for this year was to survey and attempt to determine what is being done nationally from the time a cow enters the barn until she leaves. Recommendations and practices vary from state to state, but basic recommended practices are very similar throughout the country. As a result of these similarities it was felt a basic survey could be followed to establish national patterns or trends of comparison between what is recommended and what is actually practiced on the dairy farm. What happens to the cow from the time she enters a barn until she leaves is of prime significance in relation to milk production, milk quality, abnormal milk, cow health, etc. as was indicated in the 1967 Dairy Farm Management sub-committee report.

This sub-committee's survey has developed an interesting pattern of comparison between what is nationally recommended and what is actually being done on the farm. *(a)* Concerning cow clipping and its relation to an enforced or encouraged requirement, it was found that very few areas of the country require by regulation, cow clipping, but it is encouraged throughout the country for ease of cleaning cows. Even in areas where it was only encouraged, cow clipping was enforced as needed on farms with cleaning problems. *(b)* The majority of cows were prepared for milking by washing with warm iodine water with a secondary use of warm water only. Interestingly the survey found from 2 to 80% using no preparation at all prior to milking. *(c)* Udders were dried with individual paper towels or cloth rags and sponges as a close second. An average of 10% indicated the teats and udders were not dried at all. *(d)* Stripping as an aid to stimulation and as a check for abnormal milk showed the greatest degree of variation. Percentage of dairymen actually stripping their cows varied from 15 to 80% with an average of less than 50% of the dairymen that

TABLE 3. WATER PROBLEMS AND CORRECTIVE TREATMENT

Symptoms	Explanation	Treatmenta
1. Soap curd in wash water Ring in bath tub Spots on glassware Too much cleaning compound required Scale in pipes and water heater	Hard water caused by calcium and magnesium compounds dissolved by the water	Soft water 1.0- 3.5 GPG[b] Moderately hard water 3.6- 7.0 GPG Hard water 7.1-10.5 GPG Very hard water over 10.5 GPG Use sodium zeolite water softener, size based on hardness and quantity of water used
2. Red water-clear when drawn but reddish sediment develops after standing over-night Reddish-brown stains on sinks and utensils Metallic taste	Ferrous iron compounds in solution are exposed to air (oxygen) in pressure tank. The iron is oxidized to insoluble ferric compounds which precipitate	0.2-3.0 ppm-use a polyphosphate feeder or high capacity water softener 3.1-10 ppm-use an iron removal filter or automatic chlorinator and sand filter 10.1-25 ppm-use an automatic chlorinator and commercial sand filter. A high capacity pump and large volume of water are needed to backwash the filter Over 25 ppm-treatment not practical
3. Particles of rust or black specks in clear water from tap	Insoluble ferric iron or manganese compounds	Small amounts can be removed with cartridge type filter. Large quantities require a sand filter with adequate backwash capacity
4. Reddish slime on walls of toilet tank Suspended slime in clear water from well	Iron oxidizing bacteria "feeding" on iron in pipe, pump, and tank	Disinfect well with strong chlorine solution. Automatic chlorinator and sand filter may be required if condition persists
5. Iron pipes corrode and rust rapidly, frequent replacement Rusty colored tap water Corroding joints on copper pipe	Acid water-low pH caused by carbonic acid. Carbon dioxide in atmosphere is dissolved by rainfall, and accumulates in ground water supply. May also be due to drainage of mine acid from spoil banks of coal fields Dissolved oxygen	pH-6.6-7.0-use a polyphosphate feeder or calcium carbonate neutralizer pH-5.5-6.5-use a neutralizer with water softener or automatic chlorinator to feed soda ash solution pH-4.0-5.5-use an automatic chlorinator to feed soda ash solution below pH 4.0-treatment not practical Cannot be removed economically. A polyphosphate feeder to coat the interior surface of the pipe will help.
6. Rotten egg odor Milking utensils become dull or black Black greasy feeling water causing stains in sinks	Hydrogen sulfide gas or sulfur water often found in wells near coal or "sour gas" oil fields Sulfate reducing bacteria in well water free the sulfur to form hydrogen sulfide gas Iron sulfides and manganese compounds in water	0-10 ppm-use an iron or sulfur filter, or automatic chlorinator followed by a sand filter Over 10 ppm-use an automatic chlorinator followed by a sand filter
7. Rotten egg odor in hot water only	Chemical reaction of magnesium rod in hot water tank	Remove magnesium rod—add small amount of laundry bleach
8. Turbid, cloudy, or dirty water	Suspended particles of dirt, leaves, or organic matter	Visible sediment-remove with cartridge type or sediment filter Cloudy with no visible sediment-use an alum feeder, sedimentation tank and sand filter
9. Objectionable odor or taste other than hydrogen sulfide	Chlorine due to water treatment process Decayed organic matter or surface drainage	Filter drinking water through an activated carbon filter Automatic chlorination followed by filtration through an activated carbon filter

10. Bacteria[c]—coliform	Water unsafe to drink due to sewage, manure, or surface contamination	Positive test on first sample-disinfect well or source of supply with strong chlorine solution Positive test on repeat sample-use automatic chlorination, pasteurization, or ultraviolet sterilization

[a]Use only one method of treatment when alternatives are indicated
[b]One grain per gallon (GPG) = 17.1 ppm
[c]When psychrophiles are present, use treatments as for coliform bacteria

stripped cows. The majority stripped on the floor. From 10 to 90% did not strip at all unless they knew a quarter is bad. *(e)* The average dairyman waits from 1 to 5 min before placing inflations on the cow. Inflations being placed on the cows sooner in parlors than in stanchion barns. *(f)* Overmilking is still our greatest concern nationally. The survey revealed that greater than 75% milk cows in excess of 5 min and remove all inflations at one time rather than each quarter as it is milked out. *(g)* Over 80% indicated if any stripping was done, it was machine stripping. This ties in with the over milking routine in the statement above; 20% average reported no stripping with 5% or less that hand stripped. *(h)* Very little, if any, teat dipping after milking was done. Of the few that dip teats after milking, iodine, chlorine, quats and pine oil were in use. *(i)* Less than 50% are dipping inflations in a sanitizing solution between cows. Of those that dip, the preferred sanitizing agent is iodine solutions. Apparently there was no observed correlation or difference noticed in relation to udder health between those who dip and those who do not.

Our last item of concern in the survey was the care, use, and cleaning of rubber parts, particularly inflations. Less than 40% of the responses indicated two sets of inflations were being used. If two sets were in use, a high percentage of these dairies alternated inflations. The balance, or over 60%, used the same set of inflations until worn out. In relation to cleaning inflations, responses indicate about equal use of wet soak in lye stock solution and hot soak in an inflation cleaner, then dry storage. An increasing number of dairies are using automtic CIP cleaning of the same set of inflations until they are worn out.

This survey provided some interesting data indicating all areas of the country should spend considerably more time in educational field work during the milking time on all levels, i.e., fieldmen, sanitarians, and extension personnel, to educate and encourage the dairymen to follow recommended practices to get the most out of their cows and reduce stresses placed on the cows, or revise national recommended practices to conform to what is being done.

NEWS AND EVENTS

FIRST NATIONAL CONFERENCE ON PACKAGING WASTES SEPTEMBER 22-24, 1969

Session themes and participants in the First National Conference on Packaging Wastes to be held September 22 through 24, 1969, in California at the Sheraton--Palace Hotel, San Francisco, were announced by George F. Stewart, University of California—Davis. Professor Stewart is program committee chairman and conference coordinator.

The conference evolves from the University of California—Davis packaging research and education program established in January, 1967, within the University's Food Protection and Toxicology Center. The program is conducted in cooperation with the Packaging Industry Advisory Committee composed of executives from companies broadly representing the many phases of the packaging industry. The conference is co-sponsored by the Bureau of Solid Waste Management, U. S. Public Health Service.

The 3-day conference is structured to promote meaningful dialogue among top-level officials in the total packaging and user industries, waste disposal industry, government and universities, and to attract participation of the public at large toward generating ideas and approaches in the solution of key waste disposal problems.

The overall conference program will focus attention on defining and clarifying the many problem areas related to the accumulation and disposal of packaging wastes generated by the dual forces of an exploding population and marketing trends toward a wide variety of consumer "convenience" packaged items, and similar professional and industrial "disposable" packaging, all being increasingly developed and fabricated from materials that, more and more, won't

burn, break, crush, degrade, or dissolve!

The urgency of the problem becomes readily apparent in the sheer quantity of packaging wastes that is now imposed on the overall refuse disposal facilities of the nation. Almost 50 million tons of packaging materials, which includes paper and paperboard, glass, metals, wood and plastics, currently represents about 15% of the annual U. S. total of solid wastes requiring some means of disposal. A projection of packaging materials consumption made by the Midwest Research Institute, Washington, D. C., shows that by 1976 these materials will represent an annual disposal problem in excess of 64 million tons. At the same time, the beverage container field alone will generate a disposal problem of some 61 billion nonreturnable glass and metal units.

Program committee chairman Stewart believes that the conference will not likely result in many specific answers to packaging wastes problems; however it will formulate the proper questions in terms of approach and identify individuals, industrial organizations, government agencies and universities with the capability of cooperatively developing the means for managing and controlling these packaging wastes.

USDA INVITES PUBLIC VIEWS ON PROPOSAL FOR POULTRY IN COOKED SAUSAGE

The U. S. Department of Agriculture has proposed that certain cooked sausage products, such as frankfurters and bologna, be allowed to contain up to 15 percent poultry, without affecting the product name. USDA would continue to require sausages containing more than 15 percent poultry to reflect the presence of poultry in the product name. When poultry is included, it must be named in the list of ingredients on the package. Officials of the U. S. Department of Agriculture invited comments from the public on this proposal and desired comments from a wide range of interested groups and individuals.

Officials of USDA's Consumer and Marketing Service said they had gathered considerable information on the proposed regulation, which has been requested by the poultry industry. The nutritional qualities of poultry, C&MS officials said, are similar to those of other ingredients used in cooked sausage. Trained tasting panels have found that up to 15 percent poultry did not alter the characteristics of cooked sausage, C&MS said.

If the poultry ingredient included fat or skin beyond their natural proportions in the bird, this fact would be additionally noted in the ingredients statement. The ingredients statement on a package of frankfurters for example, might say "beef, pork, water, chicken, beef hearts, chicken skin,' or it might say "beef, veal, water, turkey, pork hearts, turkey skin."

The USDA proposal also prescribes that canned poultry meat which has been shredded must be so designated. Canned shredded poultry would mean poultry meat with the normal proportions of light and dark meat which has been shredded and canned.

Under the amendment, a sausage product labeled "all meat" could contain only muscle tissue from cattle, hogs, lambs, or chickens or turkeys. No poultry by-products would be permitted in an "all meat" sausage. A product labeled "all beef," for example, would still be required to contain only muscle tissue from beef animals, in addition to condiments, curing ingredients and water for processing. Products labeled "frankfurters" could contain muscle tissue as well as by-products from cattle, hogs, lambs, chicken, or turkeys.

Interested parties were invited to make written comments during a 45-day period beginning April 9. Two copies of such comments were to be filed by May 26 with the Hearing Clerk, Room 112-A, U. S. Department of Agriculture, Washington, D. C. 20250. All comments submited will be available for examination by the public in the Hearing Clerk's office. The proposal was published in the Federal Register April 9.

NEW HEAD OF NEWS & INFORMATION SERVICE FOR DFISA STAFF

Mrs. Marilyn M. Raleigh (formerly production and illustrations editor for Science News) has joined the staff of the Dairy & Food Industries Supply Association as head of the News & Information Service. Her assignment includes general publicity, Association publications, trade publication relations, and direction of promotion and advertising programs.

A Washington, D. C. resident for the past three and a half years, she was most recently production and illustrations editor for *Science News*. She has a background of some 20 years in publication and related fields. Originally from New York she has been an editor and writer on such McGraw Hill publications as *Oilgram*, *Power*, *Coal Age*, and *McGraw Hill Digest*.

Mrs. Raleigh is married to S. M. Sharkey, Jr. columnist for Newhouse National News Service, Washington, D. C. They have two daughters.

The Dairy & Food Industries Supply Association is a 400-member organization of equippers and suppliers to the food and dairy industries. Principal membership services include marketing information, technical services, and a biennial exposition, one of the largest industrial shows in the U. S.

TECHNICAL ECONOMIC AND SOCIAL INFORMATION AVAILABLE FROM FAO

Since its creation in 1945, the Food and Agriculture Organization of the United Nations has accumulated, as a result of its worldwide activities, a wealth of technical, economic and social information, contained in some 25,000 publications and documents.

Ready access to this information has now been made possible through the services provided by the FAO Documentation Centre. Current and retrospective indexes, as well as ad hoc bibliographies on request, permit the selection of documents of interest. The selected documents are made available to users in printed form, or in the form of copies or microcopies. These services are provided free of charge, or at minimum cost.

FAO would like to bring these documentary services to the knowledge of as large a public as possible. Experience to date has been that such services answer a real need and should be widely publicized, and known to all interested bodies and individuals, particularly the readers of this periodical. Four further information write M. Moulik, Director, Documentation, Legislation and Library Division, FAO, United Nations, New York, N. Y.

TEST FOR STAPH ENTEROTOXIN SOUGHT

How can staphylococcal enterotoxin, a major cause of food poisoning, be detected if present in certain foods? M. S. Bergdoll, of the Food Research Institute at the University of Wisconsin, is wrestling with this problem right now. Many factors complicate his work toward improving and simplifying the present test for enterotoxin. First, although most people speak of the enterotoxin by itself, it has many types. The test must account for each type. This toxin can also be present in a variety of foods like dried and whole milk, cheese, cream filled bakery goods, baked ham, other meats and salads. The test should recover the enterotoxin from all types of food. It is sometimes difficult to recover or detect small amounts of the toxin in meat.

A quick, reliable test for staphylococcal enterotoxin would greatly benefit the industry. The demand is increasing for foods specified free of enterotoxin, and proof of this is sometimes needed in cases of alleged food poisoning. Many interested companies and the U. S. Public Health Service are willing to suport this research. Along with improving the present test, the Food Research Institute will prepare the specific reagents (antisera and reference toxins) for company laboratories to do their own detection with the present test. The institute will also train laboratory workers from member companies in this test procedure.

Even though enterotoxin in food can be determined. standards for minimum detectable levels will be difficult to develop. Sensitivity to the toxin varies from person to person. An amount that makes one person ill may not affect another. A minimum level of one microgram has been suggested. This very small amount compares to an ounce of gold in a 1,000-ton rock. But even this small bit of toxin can make people sick. The best way to prevent food poisoning is to keep staph organisms from growing in the food.

KENDALL HAS "THE" PROBLEM SOLVER"

Kendall's Fiber Products Division has released Code "85", a new non-gauze milk filter material for large gravity bulk tank filters. Kendall claims Code "85" is the Problem Solver and the quintessence of filtering media. It has been thoroughly tested in laboratory and in the field. Available 12 and 18 inches wide in lengths of 200 feet per roll, Kendall's Code "85" offers speed of filtration with maximum efficiency. Made of a special patented nonwoven fabric, it removes more fine sediment than gauze-faced filters but without the added cost of the gauze.

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For more information and samples, write The Kendall Company, Fiber Products Division, Walpole, Massachusetts 02081, Attention Dairy Department.

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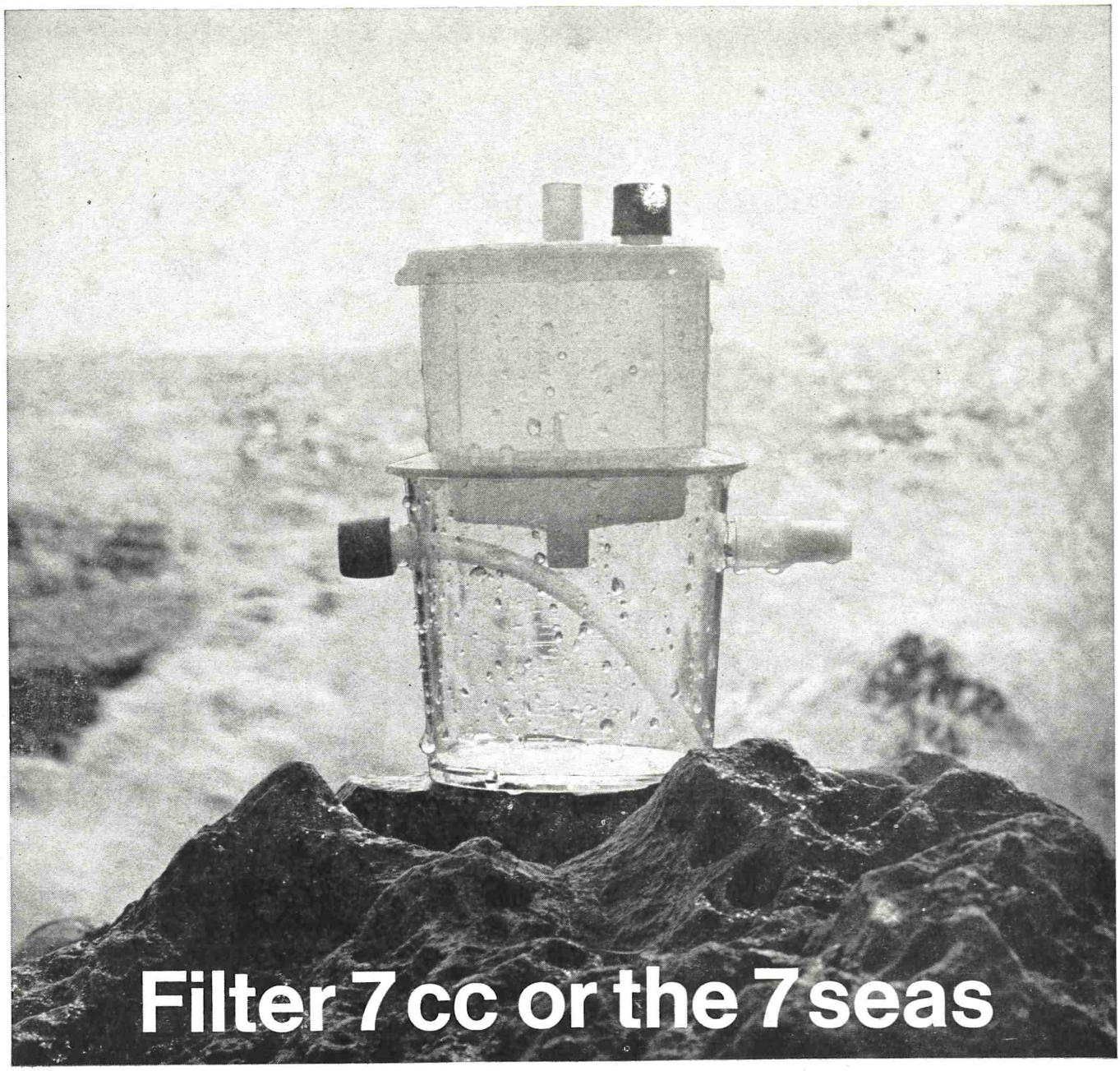

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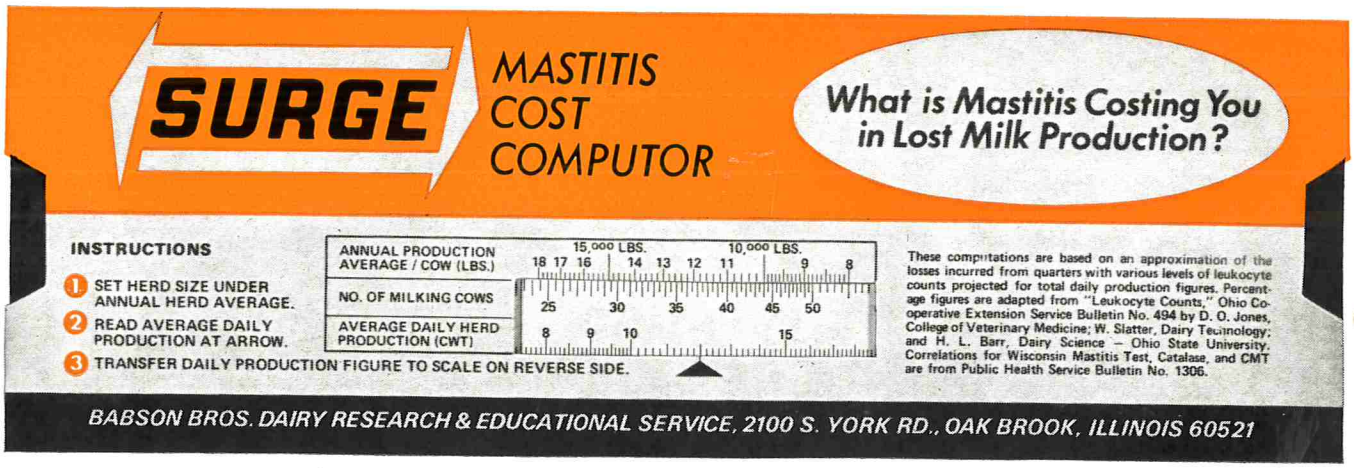

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