ISSN:0273-2866
Box 701
Ames, Iowa 50010

June 1985
Vol. 5, No. 6
Pages 201-244
$6.00

Dairy and Food Sanitation

A Publication of the International Association of Milk, Food and Environmental Sanitarians, Inc.

Ultraviolet Disinfection of Water Supplies

A Cooling Rate Survey of Cooked Foods

ACDPI Meeting Highlights

USNAC Update

Use of Plastic Loops in Fighting Mastitis

Airline Food Safety Report

72nd IAMFES Annual Meeting
August 4-8, 1985
Nashville, Tennessee

You can weigh, dissolve, wait... sterilize, wait... temper, wait... inoculate, pour, incubate.

Or, you can inoculate and incubate.

Compare 3M Petrifilm™ Plates to conventional pour plates. With Petrifilm Plates, you eliminate the tedious preparation needed with conventional pour plates. Preparing a test is quick and simple—inoculate the sample onto the Petrifilm Plate and incubate. The time and labor savings are obvious.

Petrifilm Plates are much more convenient than conventional pour plates. They can be used anytime, anywhere. No media preparation is needed. You can plate a sample on-site instead of having to bring it to the lab. Petrifilm Plates save space, too.

Petrifilm Plates provide comparable results to conventional pour plates, and you can count on consistent results because each plate is subject to the same stringent quality standard.

PETRIFILM

The Petrifilm Plate methods have been collaboratively tested and adopted by the Technical Committee of the 15th Edition of Standard Methods, American Public Health Association.

To find out more about how 3M Petrifilm Plates can simplify your testing procedures, call **(800) 328-5727** (outside MN) or **(800) 742-5685** (in MN) ask for Ext. 40.

Outside of the United States, contact the local 3M subsidiary. In Canada, contact 3M Canada, Inc., P.O. Box 5757, London, Ontario, N6A-4T1, 1-800-268-9696.

Microbiology Products
Medical-Surgical Division/3M
St. Paul, MN 55144

3M hears you...

3M

Please circle No. 154 on your Reader Service Page

international Association of Milk, Food & Environmental Sanitarians, inc.

1985
MEMBERSHIP APPLICATION

All memberships on calendar year basis, Memberships include a subscription to *Dairy and Food Sanitation* or both journals.

U.S. FUNDS

BEST BUY Check one:
- ☐ Membership with BOTH journals $50 (Dairy and Food Sanitation & Journal of Food Protection)
- ☐ Membership with *Dairy and Food Sanitation* $28

FOREIGN AND CANADA
Add $7 for each Journal ordered for postage

* Student Membership $14 for DFS - $25 for both – please include student verification

---

1985
SUBSCRIPTION APPLICATION
for agencies, associations, and institutions

All subscriptions on a calendar year basis

U.S. FUNDS

BEST BUY
- ☐ BOTH Journals $110
- ☐ *Dairy and Food Sanitation* $60
- ☐ *Journal of Food Protection* $80

FOREIGN AND CANADA
Add $7 for each Journal ordered for postage

1985
PUBLICATION ORDER FORM

3-A Sanitary Standards

( ) Complete set 3-A Dairy Stds ..... ea $30. + $3 postage
( ) Complete set 3-A Dairy & Egg Stds ..... ea $45. + $3 postage
( ) 3-A Egg Stds ..... ea $25. + $3 postage

Five-Year Service on 3-A Sanitary Standards

( ) 3-A Dairy Stds ..... Five years $22.
( ) 3-A Egg Stds ..... Five years $12.
( ) 3-A Dairy & Egg Stds ..... Five years $28.

☐ Procedures to Investigate Waterborne Illness ..... ea $1.75
25-99 copies, $1.50 ea.; 100 or more, $1.15 ea.

☐ Procedures to Investigate Foodborne Illness ..... ea $1.50
25-99 copies, $1.25 ea.; 100 or more, $.90 ea.

☐ Procedures to Investigate Arthropod-borne and Rodent-borne Illness ..... ea $2.00
25-99 copies; $1.75 ea.; 100 or more, $1.50 ea.

plus shipping charges

Please fill out completely

Name _____ Company Name _____

Address _____

City _____ State/Province _____ Country _____ Zip _____

Phone with area code _____
Job Title _____

- ☐ Payment enclosed
- ☐ Mastercard/Visa (circle appropriate card)
  - Card # _____
  - Expiration Date _____
- ☐ Bill me (payment due upon receipt)
- ☐ Please check here if you would like information on joining your state/province association.

U.S. FUNDS

MAIL ENTIRE FORM TODAY TO:

IAMFES-Dept. B
P.O. Box 701
Ames, IA 50010

Please circle No. 360 on your Reader Service Page

For faster service use your charge card & call 515-232-6699 extension B

IAMFES Sustaining Members

Alfa-Laval, Inc.
Agri-Group
11100 North Congress Avenue
Kansas City, MO 64153

Alpha Chemical Services, Inc.
P.O. Box 431
Stoughton, MA 02072

Anderson Chemical Co.
Box 1041
Litchfield, MN 55355

Angenics, Inc.
100 Inman St.
Cambridge, MA 02139

Associated Milk Producers, Inc.
830 N. Meacham Rd.
Schaumburg, IL 60195

Babson Bros. Co.
2100 S. York Road
Oak Brook, Illinois 60521

Borden, Inc.
Dairy & Services Div.
16855 Northchase
Houston, TX 77060

Dairymen, Inc.
10140 Linn Station Road
Louisville, KY 40223

Darigold
635 Elliott Ave. W.
Seattle, WA 98109

Dean Foods
1126 Kilburn Ave.
Rockford, IL 61101

Difco Laboratories
P.O. Box 1058-A
Detroit, MI 48232

Eastern Crown, Inc.
P.O. Box 216
Vernon, N.Y. 13476

GAF
1361 Alps Road
Wayne, NJ 07470

Gerber Products Co.
445 State St.
Fremont, MI 49412

Gist-Brocades USA
P.O. Box 241068
Charlotte, NC 28224

H. B. Fuller Co.
Monarch Chemicals Div.
3900 Jackson St. NE
Minneapolis, MN 55421

IBA Inc.
27 Providence Rd.
Millbury, MA 01527

Kendall Co.
One Federal St.
Boston, MA 02101

Klenzade Division
Economics Laboratory, Inc.
3050 Metro Drive
Suite 208
Bloomington, MN 55420

Maryland & Virginia Milk Producers Assn., Inc.
P.O. Box 9154 Rosslyn Station
Arlington, Virginia 22209

Michigan Milk Producers Assoc.
24270 W. Seven Mile Road
Detroit, MI 48219

Mid America Dairymen, Inc.
P.O. Box 1837 SSS
800 W. Tampa
Springfield, MO 65805

Naige Co.
P.O. Box 365
Rochester, NY 14602

Nasco International
901 Janesville Ave.
Fort Atkinson, Wisconsin 53538

National Mastitis Council
1840 Wilson Blvd.
Arlington, VA 22201

National Milk Producers Federation
1840 Wilson Blvd.
Arlington, VA 22201

Norton Co.
P.O. Box 350
Akron, Ohio 44309

Oxoid USA, Inc.
9017 Red Branch Rd.
Columbia, MD 21045

Reitman Manufacturing Co.
10319 Pearmain St.
Oakland, CA 94603

Seiberling Associates, Inc.
11415 Main St.
Roscoe, IL 61073

SmithKline Animal Health Products
P.O. Box 2650
West Chester, PA 19380

United Industries, Inc.
1546 Henry Avenue
Beloit, WI 53511

Universal Milking Machine Div.
Universal Cooperatives Inc.
408 S. First Ave.
Albert Lea, MN 56007

Walker Stainless Equipment Co.
601 State St.
New Lisbon, WI 53950

Dairy and Food Sanitation is published monthly by the International Association of Milk, Food and Environmental Sanitarians, Inc., executive offices at PO Box 701, 502 E. Lincoln Way, Ames, IA 50010. Printed by Heuss Printing, Inc., 911 Second St., Ames, IA 50010. **Second-class postage paid at Ames, IA. Postmaster: Send address changes to IAMFES, 502 E. Lincoln Way, Ames, IA 50010-0701.**

Manuscripts: Correspondence regarding manuscripts and other reading material should be addressed to Kathy Hathaway, PO Box 701, Ames, IA 50010-0701. 515-232-6699.

"Instructions to Contributors" can be obtained from the editor.

Orders for Reprints: All orders should be sent to IAMFES, Inc., PO Box 701, Ames, IA 50010-0701. Note: Single copies of reprints are not available from this address; address reprint requests to principal author.

Business Matters: Correspondence regarding business matters should be addressed to Kathy R. Hathaway, IAMFES, PO Box 701, Ames, IA 50010-0701.

Subscription Rates: $60.00 per volume, one volume per year, January through December. Single copies $6.00 each. No cancellations accepted.

Sustaining Membership: A sustaining membership in IAMFES is available to companies at a rate of $300 per year, which includes $100 credit toward an ad in the "annual meeting issue" of the Journal, the July issue. For more information, contact IAMFES, PO Box 701, Ames, IA 50010-0701, 515-232-6699.

Membership Dues: Membership in the Association is available to individuals only. Direct dues are $28.00 per year and include a subscription to **Dairy and Food Sanitation.** Direct dues and both journals are $50.00. Affiliate and International Membership include both journals for $50, plus affiliate dues. Student membership is $14.00 per year, with verification of student status, and includes Dairy and Food Sanitation. No cancellations accepted.

Claims: Notice of failure to receive copies must be reported within 30 days domestic, 90 days foreign. All correspondence regarding changes of address and dues must be sent to IAMFES, Inc., PO Box 701, Ames, IA 50010-0701, 515-232-6699.

Dairy and Food Sanitation

CONTENTS Vol. 5 No. 6 June, 1985

Dairy and Food Sanitation, Vol. 5, No. 6, Pages 204-208 (June 1985)

A Cooling Rate Survey Comparing Rapid Chill Refrigeration and Walk-in Refrigeration in Chilling Cooked Foods

O. D. Cook

Park Sanitarian
National Park Service
P. O. Box 168
Yellowstone National Park, Wyoming 82190
(307)344-7381

A cooling rate survey was conducted in operating food service establishments. The purpose was to determine how rapidly normal walk-in and rapid-chill refrigeration will reduce hot food, 140°F to 45°F, as required by the Model FDA 1976 Food Service Sanitation Manual. Rapid chill refrigeration reduced surveyed foods panned in 20" x 26" x 2" deep to 45°F or less within 4 hours. Walk-in refrigeration was inconsistent in reducing surveyed foods to 45°F or less. Foods panned in 20" x 26" x 4" containers were reasonably consistent in reaching FDA requirements under rapid-chill conditions. Under similar conditions in walk-in coolers it was impossible to achieve the desired temperature-time conditions. A discussion of mean generation times is reviewed. It is suggested a similar degree of public health protection is provided when foods reach 60°F within 4 hours and continues to cool within a reasonable time frame.

The use of product names in this article does not necessarily constitute endorsement by the National Park Service or the U. S. Government.

Presented to the Annual Region 9 and Region 10 FDA Retail Food Program directors' meeting. Boise, ID, March 27, 1985.

INTRODUCTION

Epidemiologic data for the last decade in the United States has indicated that the major contributing factors to foodborne illness were related to food temperature abuse problems. Bryan (2) reported that inadequate cooling practices were the leading contributory factor to foodborne illness outbreaks. Data from Canada (11) and England and Wales (2,3) demonstrated the major contributing factors to foodborne illness in those countries are similar to the U.S.A., i.e., inadequate cooling practices are the primary contributing factor to foodborne disease.

The 1976 Food and Drug Administration (FDA) Food Service Sanitation Manual (12) requires that potentially hazardous food be cooled from 140°F to 45°F or less in less than 4 hours to prevent hazardous bacteriologic growth. The practice is designed to reduce the opportunities for improper cooling to contribute to foodborne illness. Yet, recent data from the Centers for Disease Control (CDC) 6,7) shows no significant reduction in incidence of foodborne illness or significant change in contributing factors and their patterns. Either there still exists a problem in being able to rapidly cool food to prevent foodborne illness, or operators are not complying, for some administrative reason, such as lack of regulatory enforcement. The lack of adequately designed cooling systems to rapidly cool prepared foods may be another problem.

Snyder (9) reports there is only one stock commercial refrigerator which is specifically designed to meet this FDA requirement in terms of air flow rates, temperatures and food product geometries.

A cooling rate survey was conducted to compare the performance of rapid-chill to walk-in refrigeration practices to determine what was necessary to achieve a 4-hour cooling rate in a commercial operation. The survey's purpose was to compare rate of cooling between the two types of equipment utilizing the current practice recommended by food protection practioners. Another purpose was to determine if the current slow-food cooling practice potentially contributes to foodborne illness or prevents it.

SURVEY METHODS AND MATERIALS

Definition of Products and Operations

The restaurants utilized were identified as establishments A and B. Establishment A contained standard walk-in coolers and a 2-door rapid-chill refrigerator (Victory Model RCIS-2D-S3) (13). Establishment B contains standard walk-in refrigeration and a 1-door rapid-chill refrigerator (Victory Model RCIS-1D-S3) (13).

Foods prepared were part of the daily menu for each establishment. Foods selected were based on their viscosity and potential public health hazard. They were: French

onion soup, jello, long grain rice, clam chowder, roast duck and beef stew.

Hot food from 140°F to 170°F was panned in 2 and 4-inch 20" x 26" standard pans after preparation. Product depth varied from 1 1/2 inches to 1 7/8 inches deep in the 2-inch pans. Product depth in the 4-inch pans were from 2 1/2 inches to 3 1/4 inches. Filled pans were covered with plastic wrap and placed into the walk-in cooler and/or rapid chill refrigerator.

Pans were placed on semisolid metal shelving in restaurant A's walk-in coolers. Pans were placed on solid metal shelving in walk-ins in restaurant B. In restaurant A's rapid chill refrigerator, pans were inserted onto the mobile wire rack. In restaurant B, flat solid pans were placed between the wire supports on the metal wire rack. The rack was damaged and could not freely support the standard pans inserted onto the rack. Standard pans with hot food were then stored on the flat pan supports.

Restaurant A's operational instructions required the rapid chill's "blast chill" timer to be set for one hour when hot food is placed into the unit. In restaurant B, the "blast chill" timer was to be set for two hours for each hot food placed into the unit. During periods of use, either rapid chill's "blast chill" timer is being periodically reset to the one or two-hour time period as prepared hot food is placed into the unit for cooling.

This survey did not evaluate variables such as: rates of airflow, total BTU load placed in each refrigerator, the refrigerator's BTU per-hour capacity, storage location within the refrigerator or type of storage shelving. These variables are important in effecting cooling rates.

MEASUREMENTS

Product temperature was evaluated at one-half hour intervals with a Taylor 6072 metal stem 5-inch thermometer. Thermometers were calibrated to ± 2°F according to National Sanitation Foundation (5) calibration instructions. Refrigeration indicating thermometers were calibrated against a reference metal stem thermometer for accuracy of ± 2°F. Product temperature measurements were taken at the geometric center of the test food by inserting the 1 1/2 inch end sensitive part of the thermometer spanning the center.

RESULTS

The cooling rates for foods of low viscosity (French onion soup and jello) are found in Figures 1 and 2. French onion soup and jello in both the 2 and 4-inch pans cooled to 45°F within 3 hours in the rapid chill unit. Jello and soup in the 2-inch pans in the walk-in achieved 48°F at 4 and 6 hours, respectively. The soup and jello 4-inch walk-in pans would have cooled to 45°F in excess of 6 hours.

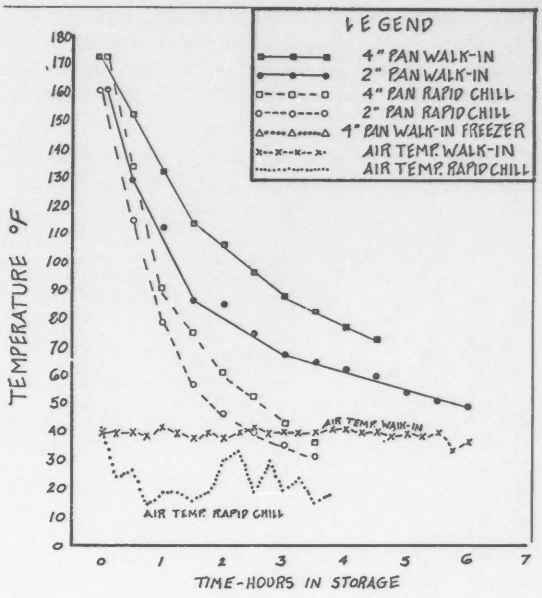


Figure 1. *Comparison of cooling rates for French onion soup in rapid chill refrigeration vs. walk-in cooled refrigeration.*

Long grain rice was chosen for its starchiness, heavy consistency and potential hazard from *B. cereus*. There was an apparent discrepancy between the two rapid chill units in cooling rice. In restaurant A (Fig. 3), the 2-inch pan cooled to 45°F or less in 1 1/2 hours whereas the 2-inch pan in restaurant B took 4 1/2 hours (Fig. 4). Rice was baked in restaurant A which gave the rice more air

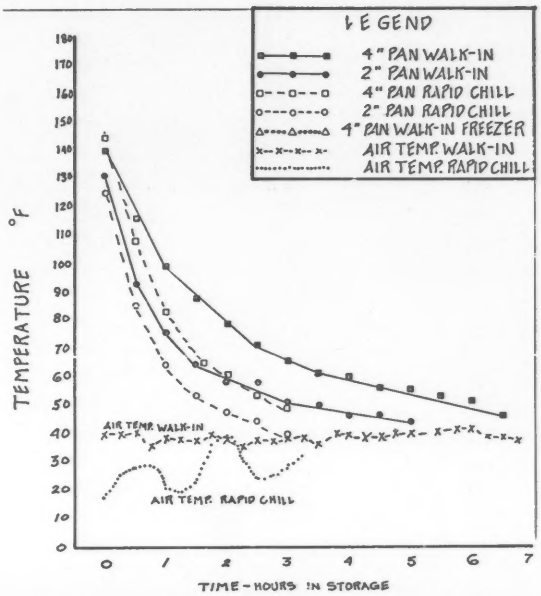


Figure 2. *Comparison of cooling rates for red jello in rapid chill refrigeration vs. walk-in cooler refrigeration.*

space between granules than steamed rice (restaurant B). The difference in preparation and the obstruction to circulating air caused by the use of flat pans in the "B" rapid chill may have contributed to the longer cooling time.

Rice was placed in 4-inch pans in the walk-ins and rapid-chill units and could not achieve 45°F in 4 hours.

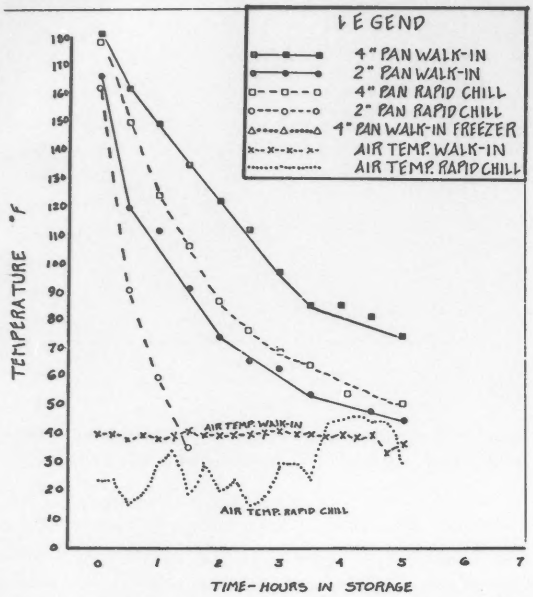


Figure 3. *Comparison of cooling rates for long grain (baked) rice in rapid chill refrigeration vs. walk-in cooler refrigeration.*

Rapid chilling reduced temperatures to 54°F in both facilities in 4 and 5 hrs. respectively. Bryan et al (4) pointed out that the temperature range for growth for *B. cereus* is 59° to 109°F. The mean generation time (MGT) below 59°F will be sufficiently lengthened so that adequate protection is present by preventing rapid multiplication of this potential pathogen.

Clam chowder was chosen as a viscous creamed based soup (Figs. 5 and 6). Rapid chill units effectively reduced the product to 45°F or less within 3 hours using 2-inch pans. A temperature range of 55°F - 65°F was attained in 4-inch pans in rapid chill units for the same time period. Results for walk-in coolers show that the 45°F cooling rate would not be achieved in 4 hours with either 2 or 4-inch pans.

There is frequently a suggestion that freezers will cool food faster than walk-in coolers. Surplus clam chowder in establishment B was placed in a 4-inch pan and stored in a walk-in freezer. Ambient air temperature of the freezer was between -2°F and -4°F during the observation period. Temperature reductions for this product were similar to the same product in 4-inch pans in a walk-in cooler where ambient air temperature was 40°F ± 3°F. Neither would have achieved the FDA standard.

Beef stew was evaluated in only restaurant B. A 1 7/8-inch thickness was cooled to 45°F in 3 hours in the rapid-chill unit (Fig. 7). A similar quantity cooled to 65°F in 5 hours in the walk-in coolers. The 4-inch pan in the rapid-chill unit cooled to 65°F in 5 hours.

Duck was evaluated in establishment A (Fig. 8). The duck prior to roasting weighed 4.9 lbs., and after cooking 2.5 lbs. Placement into the rapid chill unit reduced the

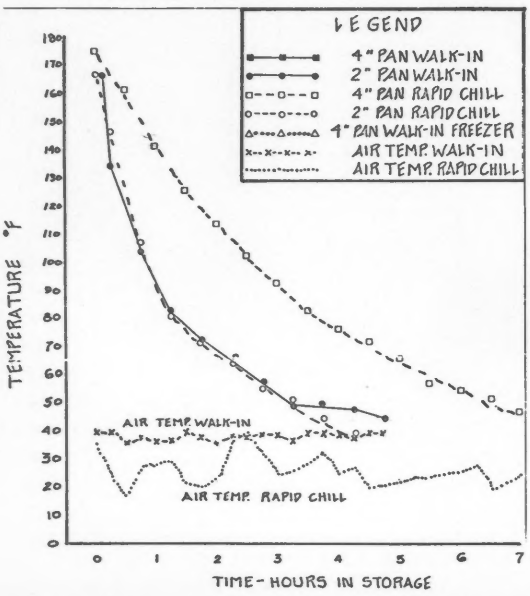


Figure 4. *Cooling rate comparison for long grain (steamed) rice in rapid chill refrigeration vs. walk-in refrigeration.*

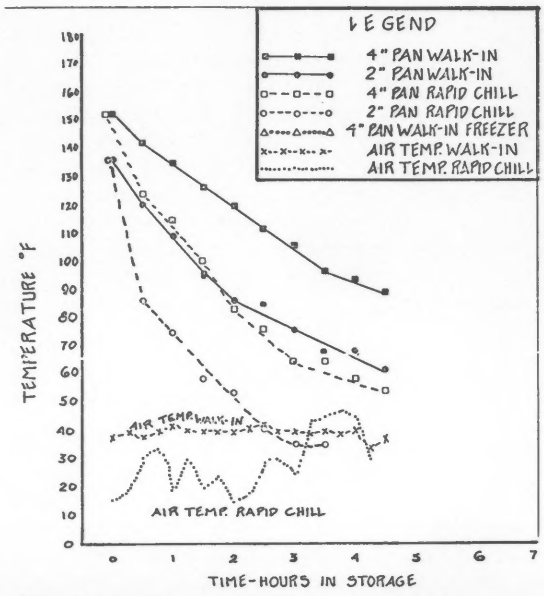


Figure 5. *Cooling rate comparison for clam chowder in a two door rapid chill refrigeration vs. walk-in refrigeration.*

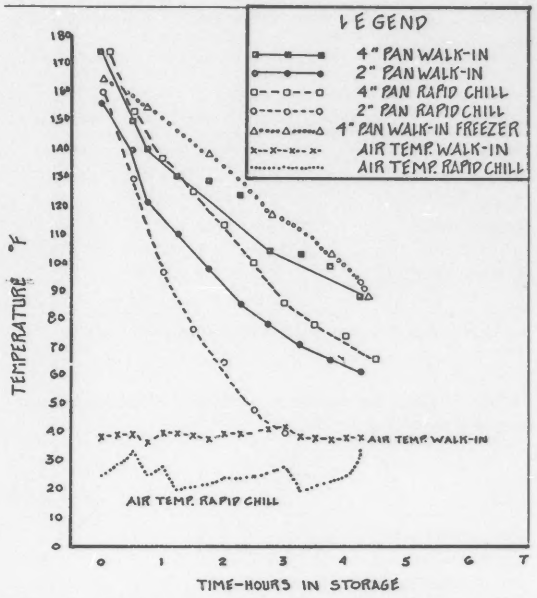


Figure 6. *Cooling rate comparison for clam chowder in one door rapid chill refrigeration vs. walk-in refrigeration.*

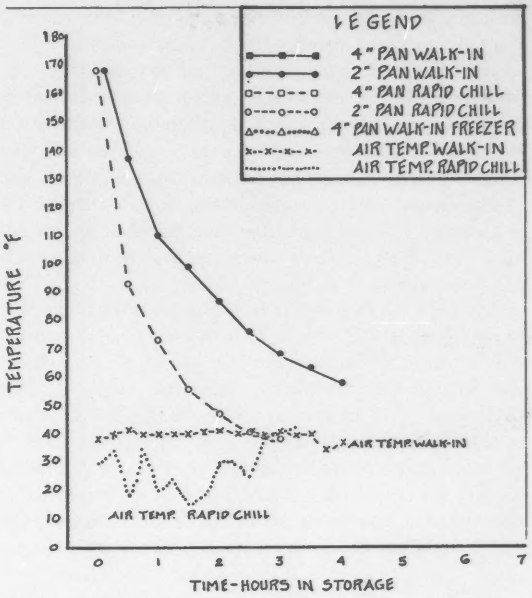


Figure 8. *Cooling rate comparison for duck in rapid chill refrigeration vs. walk-in refrigeration.*

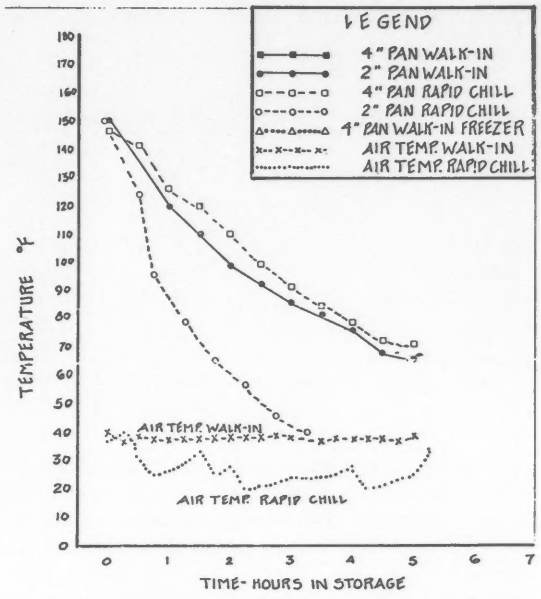


Figure 7. *Cooling rate comparison for beef stew in rapid chill refrigeration vs. walk-in refrigeration.*

temperature from 165°F to 47°F in 2 hours. The duck in the walk-in had cooled to 58°F after 4 hours.

The survey revealed rapid chill refrigeration can reduce these products to 45°F or less within 4 hours or less where product did not exceed a 2-inch depth. Two-inch pans of jello and long grain rice met FDA standards when placed in walk-in refrigeration. Rice, beef stew and clam chowder placed in 4-inch pans in the rapid chill were not cooled to 45°F within 4 hours. However, product temperatures were reduced to a range from 60°F to 45°F where MGT for the most common foodborne pathogens (*S. aureus, C. perfringens, B. cereus* and *Salmonellae*) may be lengthened to several hours between each generation (8). Cooling rates may have been somewhat faster for both systems if the pans were not covered as required by FDA (12). This survey's results suggests that many foods which are covered and placed into walk-in coolers will cool to 45°F in *excess* of 4 hours even at 2-inch depths!

The rapid chill refrigerator achieves the high cooling rates due to high velocity air across the product. The manufacturer states that "all four fans are used during the 'blast chill' cycle, circulating 28°F to 38°F air at a rate of 3300 cfm" (1500 fpm)(13). Walk-ins are not designed to meet temperature and air flow rates as described for this rapid chill unit. This survey basically concurs with Snyder (9) that rapid chill refrigeration apparently is the only current mechanical refrigeration system which meets the FDA foodservice requirements.

Survey results, especially for the walk-ins, pose some potential public health concerns. Data from the CDC (6,7) suggests there has been no significant decrease in foodborne disease recently in the U. S. One must then question if current practice is preventing public health problems. One may wonder if food protection practitioneers are emphasizing the most frequently implicated epidemiologic factor contributing to foodborne disease, i.e., improper cooling practices.

Rapidly chilled food is in a dynamic environment of constantly changing temperatures. The available literature

dealing with foodborne pathogens' generation times deals with the specified pathogen in artificial media, or in a specific food environment at constant not *changing* temperatures. This survey suggests either current information on population dynamics in a rapid chilling environment is not well understood; or, a standard has been promulugated which is difficult for the industry to meet; or there is insufficient administrative enforcement of the current requirement by food protection practitioneers, or, a combination of these factors continues to contribute to the foodborne illness problem in the U. S.

Perhaps a species management approach would be better. Rivituso and Snyder's (8) review of MGT's, at various temperatures for growth of *S. aureus, C. perfringens* and *Salmonellae*, revealed a wide time range for each pathogens' MGT in various foods. MGT's for *S. aureus* at temperatures from 10°C to 15°C range from 1550 to 12 hours, respectively in various foods (Table 1). Tables 2 and 3 for *C. perfringens* and *Salmonellae*, respectively, show similar patterns. *C. perfringens* MGT ranged from 818.3 hours to 13.6 hours from -1.7°C to 10°C, respectively. *Salmonellae* MGT ranged from 496.6 hours to 9 hours from 4.5°C to 13°C, respectively. Some caution must be used in interpreting the data as each food environment will have its own MGT depending on the temperature, chemistry and microbial flora. Generation times for pathogens may be shorter when heat treatment has reduced competing microbiological populations. This data and the survey data suggests that when many heat processed foods are reduced to 60°F within 4 hours the microbe's MGT should not permit it to become a hazard where food continues cooling to 45°F or colder.

TABLE 1. *Mean Generation Times (MGT) of* Staphylococcus aureus *from 7.2°C - 15°C.*

Food	Holding Temperature (°C)	MGT (min)	MGT (hrs)
Fresh raw eggs	12.0	9.3×10^4	1550.0
Raw ground beef	4.0	2.98×10^4	496.7
Egg custard	7.8	1.77×10^3	29.5
Egg custard	8.9	1.01×10^3	16.8
	10.0	7.22×10^2	12.0
Chicken ala King	8.9	3.34×10^3	55.7
	10.0	1.22×10^3	20.3

(Adapted from Rivituso and Snyder J. Food Prot. 44:770-775)

TABLE 2. *Mean Generation Times (MGT) of* Clostridium perfringens *from -1.7°C to 10°C.*

Food	Holding Temperature (°C)	MGT (Min)	MGT (hrs)
Raw ground beef	−1.7	4.91×10^4	818.3
Fresh chicken	1.1	1.19×10^3	19.8
Ground beef casserole	10.0	8.17×10^2	13.6

(Adapted from Rivituso and Snyder J. Food Prot. 44:770-775)

TABLE 3. *Mean Generation Times (MGT) of* Salmonellae *from 1°C to 16°C.*

Food	Holding Temperature (°C)	MGT (Min)	MGT (Hrs)
Raw ground beef	1.0	9.7×10^2	16.2
	4.5	2.98×10^4	496.6
	7.0	6.41×10^3	106.8
	12.5	7.48×10^2	12.5
Skim milk	13.0	5.41×10^2	9.0
Evaporated milk	13.0	6.45×10^2	10.9
Chicken ala King	7.8	1.31×10^3	21.7
	8.9	1.31×10^3	21.8
	10.0	1.01×10^3	16.8

(Adapted from Rivituso and Snyder J. Food Prot. 44:770-775)

CONCLUSIONS

This survey demonstrated that rapid chill refrigeration will meet the FDA standards when using 2-inch thickness liquid and semisolid foods. It demonstrated that walk-in refrigeration will not consistently cool hot food to 45°F within 4 hours even where 2-inch product depths were used under the described conditions.

Liquid and semisolid foods rapidly chilled at 4-inch depths in this survey consistently were reduced to the range of 65°F to 45°F within 4 hours. A review of MGT's for three pathogens suggests that generation times are increased to an extent that between 60°F to 45°F no more than one generation for these pathogens should take place in 5 hours.

The survey revealed a need for more research on post processing pathogen contaminates and their population dynamics during the rapid chill process. This research should be extended to include sporulation dynamics of *C. perfringens* and *B. cereus* during the rapid chill process in the foodservice industry.

Survey data has implications for food service operations where large food quantities are prepared far in advance of service, i.e., 1/2 day or more. Large operations employing cook/chill/recook systems described by Bobeng and David (1), institutions, cafeterias and dining rooms engaged in volume food production should be mandated to have mechanical rapid chill units to achieve required cooling rates. Where good rapid cooling practices are instituted and enforced administratively by industry and government, we should then see a decline in foodborne illness incident rates.

Acknowledgements:

The author gratefully acknowledges the technical assistance of O. P. Snyder, PhD and R. T. Marshall, PhD and clerical assistance by Marilyn Laubach.

con't. p. 211

Dairy and Food Sanitation, Vol. 5, No. 6, Pages 209-211 (June 1985)

Ultraviolet Disinfection of Water Supplies

IAMFES Farm Methods Committee, Water Treatment and Protection Subcommittee

H. V. Atherton, *University of Vermont, Burlington, VT 05405, Chairman.*
D. Baker, *FDA Center for Veterinary Medicine, Rockville, Maryland 20857.*
P. Benedetti, *California Department of Food and Agriculture, Oakland, California 94607.*
E. Carroway, *Texas State Dept. of Health, Austin, Texas 78756.*
G. Miller, *Babson Bros. Co., Oakbrook, Illinois 60521.*
G. W. Ronald, *University of Iowa Hygienic Laboratory, Des Moines, Iowa 50319.*
I. M. Ryan, *Wyeth Nutritionals, Inc., Georgia, VT 05468.*
K. Seaman, *Vandevort's Dairy, Fort Worth, Texas 76104.*

Use of ultraviolet radiation to disinfect drinking water supplies has been studied for a half century and, under strict limitations, has had USPHS approval since 1966. Study and publicity indicating chlorination causes certain environmental problems has renewed interest in this process. This report from the Farm Methods Committee attempts to describe the UV concept of water treatment and currently recognized advantages and limitations of the process. Properly installed UV systems would seem to be a satisfactory, cost-effective procedure for controlling many microbial contaminants of water intended for dairy and other food industries. Present systems may be less effective against Giardia *cysts and cells of* Yersinia enterocolitica. *UV treatment offers no residual bactericidal action. A practical method of measuring and recording actual delivered UV dose in the UV contactor is desperately needed.*

Ultraviolet radiation is that band of radiation which is found just below the violet end of the visible spectrum. The sun is the major natural source. "Black-light" lamps, sun-tan lamps, germicidal lamps, etc. produce ultraviolet radiation artificially. Germicidal ultraviolet rays must contact the microorganism if bacteria and mold spores are to be destroyed.

Ultraviolet treatment of water supplies to control multiplication of bacteria and microorganisms has been studied for the past half century. Chlorination has been the common disinfecting agent because it is inexpensive and easy to use. Several alternative methods of disinfection have shown promise in specific application but the low cost of chlorine treatment has limited the general acceptance of these other procedures.

Proponents of ultraviolet technology note that certain psychrotrophic bacteria, known to be able to break down the fat and protein in milk, resist very high concentrations of chlorine. Concentrations of chlorine necessary to destroy viruses and protozoa which have formed cysts are not well understood. The latter, which are particularly chlorine resistant, may be present in ground water in areas where fractured rock or limestone channels exist. Recent developments in the design of components make ultraviolet (UV) radiation an inexpensive and generally successful method of treatment.

Recent studies have shown that chlorination causes several environmental problems. Residuals and by-products can be toxic to aquatic life in receiving waters. Some by-products of chlorination may be carcinogenic and may require removal by a downstream treatment plant or point of use. The Soap and Detergent Association said in their Environmental Report (8/2/82) that, "Excessive chlorination of public drinking water supplies in Illinois--and possibly throughout the midwest--is producing mutagens suspected of causing cancer, according to a new water resource report." It has also been discovered that chlorination is much less effective in virus destruction than in killing bacteria.

The problems with chlorination have caused consulting engineers, users and regulatory agencies to actively pursue alternatives for disinfection; ultraviolet energy is one of the leading candidates.

Ultraviolet disinfection of water employs low-pressure mercury lamps. They generate shortwave ultraviolet in the region of 253.7 nanometers which is lethal to most microorganisms including bacteria, protozoa, viruses, molds, yeasts, fungi, nematode eggs, and algae. As the water is exposed to the ultra-violet rays, it breaks through the outer membrane of the organisms. This causes the release of the DNA, and therefore, destroys it. For each given microorganism and UV wavelength, the percent killed depends upon the product of the UV intensity and exposure time. This product is known

as dosage, which is the single most important parameter for rating UV disinfection equipment. The units are commonly manufactured for a 99.9% kill rate which is a combination of flow rate, intensity and exposure.

There is no universally accepted minimum dosage requirement for ultraviolet disinfection systems. In 1966, the United States Public Health Service published a Policy Statement on the use of the *Ultraviolet Process for Disinfection of Water* that set a drinking water disinfection minimum dosage of 16,000 MWS/cm^2 (Microwatt seconds per square centimeter). This statement has formed the basis for the several standards published throughout the world.

Ultraviolet units have many advantages. There is no chemical consumption which eliminates storage, transportation, handling, and repurchasing problems, as well as potential safety hazards. The minimal contact time is only 3-4 seconds while chlorine generally requires 20 to 45 minutes. Thus, the need for extra holding tanks is eliminated. The UV unit can be installed up and out of the way; no floor space required for most units. Flow rate and intensity dosage can easily be matched to give a 99.9% kill rate. A typical unit with a 36" lamp inside a quartz sleeve located in the center of a 3" chamber will emit a dosage of about 47,800 MWS/cm^2 initially and about 33,000 MWS/cm^2 after 9,000 hours of continuous operation at ten gallons per minute. Dosage at the end of 9,000 hours (about one year) is still over two times the minimum recommendation of the U.S. Public Health Service, which as mentioned earlier was 16,000 MWS/cm^2. There are no harmful by-products formed by the UV unit and it does not change the taste, pH or odor of the water supply as in chlorination disinfection. There is a minimum of, or no, moving parts which result in a highly reliable product. An option that manufacturers offer is a sensing unit which senses the lamp output. When the dosage level falls below a safe level the sensor will initiate one or more of the following: shut off the water supply completely until the lamp is replaced; bypass the UV unit; sound an alarm buzzer; light up a warning light; or simply display the output on a meter. The energy requirements are very low for the UV. A typical unit can treat 6,000 gallons for the cost of one kilowatt hour of electricity. Installation is quite simple; basically all that is needed is an inlet and outlet connection. These can be quick disconnect fittings for easy servicing or replacement, if needed.

Disadvantages of the UV include the lack of residual bactericidal action. The water may become recontaminated after treatment if left exposed to outside sources of contamination. Upon initial installation of a UV unit it is recommended that the water distribution system be superchlorinated to kill existing organisms. If recontamination occurs, it may be necessary to repeat the process. Color, turbidity, and organic impurities will interfere with the effectiveness of the ultraviolet rays. Pretreatment of the water may be necessary to remove these elements.

A recently concluded study led by Dr. Dale Carlson of the University of Washington investigated the effectiveness and reliability of UV disinfection in small water systems. It showed *Giardia* cyst inactivation occurs but only on much longer exposure to UV light than is necessary to inactivate bacteria. Color in the water interfered with UV inactivation of *Giardia* cysts, but inorganic or organic turbidity particles (5 um or less) had no effect on cyst inactivation by UV. Turbidity particles did, however, interfere with UV inactivation of *Yersinia enterocolitica* and *E. coli*.

The investigators recommended that the effects on *Giardia* sp. of storage, temperature and sedimentation in the aquatic environment need to be studied as related to potable source water management and treatment. They observed that a practical method of measuring and recording the actual delivered UV dose in the UV contactor is desperately needed.

The USPHS has accepted UV purification of water if the system includes safety devices which stop the flow of water as soon as the light intensity falls below acceptable levels. Meters are available to continously monitor and permanently record the intensity of UV treatment, a much desired feature in regulatory control and essential for USPHS approval. The UV unit should be checked periodically for buildup on the water contact surfaces. Buildup on the quartz tube can and will reduce the dosage level. The Public Health Service report indicated one of the criteria for acceptability of UV was that "the unit shall be designed to permit frequent mechanical cleaning of the water contact surface of the jacket without disassembly of the unit." Commercial literature indicates wiper assemblies are available on recent models to satisfy this need. Parameters for UV acceptance are commonly based on USPHS standards. Guidelines are being reviewed by some regulatory groups so that a new set of standards may be developed. Original guidelines were developed in April of 1966. We have learned a lot about UV technology since that time so those guidelines may not be practical today.

The UV lamp loses approximately 40% of its radiation after one year's use. The lamp should be replaced yearly; or if equipped with a sensor, it may be less frequent. Lamp replacement is a cost to the consumer. Proponents of UV argue that it is a small cost when an initial contaminated water supply is compared to a 99.9% bacteria kill.

The difficulty of on-site testing is another problem. A simple residual test can be run on chlorine by the consumer. If performed routinely, treatment of the water supply can be assured. With UV there is no residual to test so a more sophisticated bacteria plate count must be taken. This cannot be done by the average consumer and is usally left up to the state or county health departments.

Problems of UV are mainly associated with the tendency of turbid waters to quickly coat the UV lamps, thus lowering UV intensity to inadequate levels. Insurance companies

have cancelled contracts in some systems which did not provide an outlet for firefighting, ahead of the UV unit, should the fail-safe device cause the unit to cut-out during a period of such heavy usage.

The use of UV treatment of dairy wash waters has been known to the butter and cheese industries for many years. Chlorination failed to control many spoilage organisms in these wash waters but UV was found to give effective control over chlorine-resistant species. Modern technology suggests there are additional uses for UV in our dairy and food industries.

UV systems are being used to control bacteria and other microorganisms in brine and sweet water systems. Air in processing or packaging rooms may use UV to eliminate microbial contaminants. Distilled water is being treated with UV lights in some laboratories. Water used for injecting moisture may be treated in a similar manner. Some air blowers used to dry processing lines after cleanup incorporate UV treatments to prevent air contamination in the lines.

Use of UV units in water vending machines was discussed in the 1982 report of the Food Equipment Sanitary Standards Committee. Ultraviolet disinfection is "an effective alternative to chlorine as a means of disinfecting municipal wastewater effluent" according to a report in a 1980 issue of the Journal of the Water Pollution Control Federation. The report expressed concern about the carcinogenic hydrocarbons formed in chlorine-treated water, also that the chloramines were "not as effective against pathogenic viruses as public health would dictate". It was stated also that "UV was as effective against pathogenic viruses as public health would dictate". It was stated also that UV was as effective against pathogenic viruses as against vegetative bacteria. Also, there appeared to be no effect of UV treated water on rainbow trout. Overall costs are reported to be in line with ozone treatment.

UV radiation of recirculating, agitated, warm water for hot tubs, spas, and whirlpools has been recommended as effective against Pseudomonas species if organic matter is not too high. Research workers in Israel have developed a line of economical water sterilizers using UV treatment. The commentary notes that "an automatic solenoid valve shuts the system off in case of power failure or malfunction and an automatic wiper keeps the UV quarts tube clean." It is noted that 50,000 l (13,200/gal) of water can be sterilized for 1 1kW of energy used.

In summary, it would appear that the pros outweigh the cons in the debate over ultraviolet disinfection. The recent studies on the effects of chlorine in water supplies and the favorable application of UV technology in the dairy food industries confirm our beliefs even more. The UV is a valid alternative; it is a cheap price to pay for 99.9% bacteria free water and with its sensor capability along with its high reliability, it may become an overwhelming choice over chlorination in today's industry.

Cook, *con't. from p. 208*

REFERENCES

1. Bobeng, B. J. and B. D. David. 1977. HACCP Models for Quality Control of Entree Production in Food Service Systems. J. Food Prot. 40:632-638.
2. Bryan, F. L. 1978. Factors that Contribute to Outbreaks of Foodborne Disease. J. Food Prot. 41:816-827.
3. Bryan, F. L. 1981. Hazard Analysis Critical Control Point Approach: Epidemiologic Rationals and Applications to Foodservice Operations. J. Environ. Hlth. 44:7-14.
4. Bryan, F. L., C. A. Bartleson and Norma Christopherson. 1981. Hazard Analysis, in Reference to *Bacillus cereus*, of Boiled and Fried Rice in Cantonese - Style Restaurants. J. Food Prot. 44:500-512.
5. National Sanitation Foundation. Thermometers in Food Service - Pocket Guide. National Sanitation Foundation, Ann Arbor, Mich.
6. Public Health Service 1983. Foodborne Disease Surveillance - Annual Summary 1980. Centers for Disease Control, Atlanta, GA.
7. Public Health Service 1983. Foodborne Disease Surveillance - Annual Summary 1981. Centers for Disease Control, Atlanta, GA.
8. Rivituso, C. P. and O. P. Snyder. 1981. Bacterial Growth at Foodservice Operating Temperatures. J. Food Prot. 44:770-775.
9. Snyder, O. P. 1981. A Model Food Service Quality Assurance System. Food Technol. 35:70-76.
10. Thompson, W. S., F. F. Busta, D. R. Thompson and C. E. Allen. 1979. Inactivation of Salmonellae in Autoclaved Ground Beef Exposed to Constantly Rising Temperatures. J. Food Prot. 42:410-415.
11. Todd, E.C.D. 1983. Factors That Contributed to Foodborne Disease in Canada, 1973-1977. J. Food Prot. 46:737-747.
12. U.S. Department of Health, Education and Welfare, Food and Drug Administration. 1976. Food Service Sanitation Manual. U.S. Government Printing Office. Washington, D.C.
13. Victory, 1979. Rapid Chill Refrigerator. Storage Refrigerator. Victory Food Equipment Div., Member of Bastain Industries, Plymouth Meeting, PA.
14. Willardsen, R. R., F. F. Busta, C. E. Allen and L. B. Smith. 1978. Growth and Survival of *Clostridium perfringens* During Constantly Rising Temperatures. J. Food Sci. 43:470-475.

Plastic Loop Helps Cows Fight Off Mastitis

Scientists have designed and tested a simple plastic loop that helps cows fight off mastitis, the most serious disease of dairy cattle, U.S. Department of Agriculture researchers said today.

Animal scientist Max J. Paape of the Department's Agricultural Research Service reported that roughening surfaces of anti-mastitis loops gives cows a biological edge against mastitis.

The loop is inserted harmlessly into a cow's udder where it stimulates disease - fighting white blood cells or somatic cells, to rally against bacteria that cause mastitis. An original plastic loop, invented in 1978, had smooth surfaces.

Earlier this year in Israel, cows with abraded loops produced three and one-half pounds more milk each day than cows without loops, said Paape.

In 1978-79, Paape tested smooth loops on three Maryland herds, but results were disappointing, he said. "Then, almost by chance, we found that scratched loops were more effective: they caused more somatic cells."

Electron microscope photographs showed that a coating of somatic cells adhered to loops that had been accidentally scratched during insertion, he said.

In further research, scientists sandpapered the loops, which led to a dramatic jump in somatic cell counts, from about 300,000 per milliliter of milk with the old smooth loops to over 1,000,000 with the new, roughened loops, Paape said. About 900,000 somatic cells per milliliter in the final milk (stripping milk) after the cow is milked out is thought necessary to stop most mastitis infections.

The loop does this without greatly increasing the somatic cell count of the milk sent to the dairy, Paape said.

Mastitis is the most frequently occurring disease of dairy cows worldwide. Cows are normally treated with antibiotics after it is detected. However, the treatment is expensive and the cow's milk must be discarded for four to five days after treatment, Paape said.

Most of the research to evaluate the loop's effectiveness, since its invention in 1978 by California veterinarian William Kortum, has been carried out at the research agency's Milk Secretion and Mastitis Laboratory in Beltsville, Md., according to laboratory chief Robert H. Miller.

In Israel, large-scale field trials of abraded loops are being conducted by Gideon Ziv of Kimron Veterinary Institute in cooperation with the USDA, Paape said. Results show that incidence of severe mastitis has been reduced 75 percent by the new, abraded loop. In milk cases (detected only by laboratory tests), only 5 percent of cows contracted mastitis with abraded loops in place, Paape said. The tests are part of the Binational Agricultural Research and Development (BARD) agreement between the United States and Israel.

The improved loop may represent the first practical system to prevent infection in the mammary glands of dairy cattle, but it is not a cure-all, Paape said. For the loop to be fully effective, farmers must also practice good sanitation and animal management, he said.

Paape expects the new abraded loop to be available to veterinarians within a year.

For more information contact: Max J. Paape, animal physiologist, Milk Secretion and Mastitis Laboratory, Animal Science Institute, USDA, Agricultural Research Service, Beltsville MD, 20705 301-344-2302.

New Consulting Firm Announced

Charles Felix has announced the formation of Charles Felix Associates, a consulting firm dedicated to the promotion of public health and food protection through association management, Washington representation, newsletter publishing, environmental health communications and training aids. For more information contact: Charles Felix, 229 North Street, N.E., P.O. Box 1581, Leesburg, Virginia 22075. 703-777-7448.

USNAC Members Receive Strong Dairy Initiative

Very active participation in research, discussion and other groups of the International Dairy Federations' functions are bringing into the United States a strong initiative for development on procedures, regulations, technological developments and cross referencing of activities on behalf of the dairy industry.

Participation by members of the United States of America National Committee of the International Dairy Federation, referred to as USNAC, in recent meetings and appointments on working committees, has grown considerably in the four years since its organization. Seven new members in 1984 brought total US member companies to 42 in USNAC at the end of last year and opportunities to bring important IDF participation to industry meetings scheduled during 1985 here in the US.

Warren Clark, executive director of the American Dry Milk Institute and Whey Products Institute has

reported the date of October 27-29, 1986, for an "International Whey Conference" to be held in the Chicago area. This will be a joint venture of the US Department of Agriculture, Whey Products Institute, USNAC and the International Dairy Federation. An estimated 400 people will be attending the meetings scheduled for the Chicago O'Hare Marriott Hotel, he said.

The most important evidence of the benefits of membership by the US members (USNAC) in the International Dairy Federation is the almost constant flow of reports, developments and working papers that are being prepared and published by the ongoing committees and commissions within IDF. Of considerable importance is the fact that no paper or report is final in that it continues to be updated and revised as additional materials and information become available. It includes 134 items under review by 39 Groups of Experts on standard methods of analysis alone.

Reports of all sessions, symposium and seminars are published and made available to all members. A complete report on the 68th annual session of IDF, held last September in Prague, Czechoslovakia, as made available to members of USNAC, contains 139 pages, including a listing of documents published and documents still to be published by IDF. It also contains a complete timetable of presently established sessions, seminars, symposia and workshops - including a Cheese Week to be held in Switzerland during the spring of 1986.

Membership information may be obtained by writing: H. Wainess, Secretary, US National Committee of IDF, 404 Central Avenue, Room 24, Northfield, IL 60093.

Record Attendance at ACDPI Annual Meeting

A well-balanced program featuring sessions on marketing, technological advances, and product quality coupled with outstanding Southern hospitality accorded by the Opryland Hotel management and staff generated a record attendance at the March 17-20, 1985 ACDPI Annual Meeting/Kultures and Kurds Klinic/International Cultured Product Evaluation Sessions in Nashville, Tennessee.

Steffen Dairy Foods Co., Inc., Wichita, Kansas was recipient of the prestigious Neil C. Angevine Superior Quality Award at the recent 1985 Annual Meeting/Kultures and Kurds Klinic/International Cultured Product Evaluation Sessions. This award is presented annually to the processing concern with the highest cumulative quality score for yogurt, buttermilk, sour cream and cottage cheese analyzed by expert judges during the Conference.

Pictured (L to R) are: Jeff Edwards (ACDPI Assistant Secretary), The Kroger Co.; Bill Ezell (ACDPI Board Chairman), Purity Dairies; Larry Hoffman, Steffen Dairy Foods Co.; John Allen (ACDPI Board Vice Chairman), Southland Corp.; Glenn Witte (ACDPI President) MIF; Bill Born (Evaluation Sessions Assistant Coordinator), Dean Foods Co.; Dr. Ron Richter (Evaluation Sessions Coordinator), Texas A & M University; Earl Connolly (Evaluation Sessions Associate Coordinator), Fantasy Flavors, Inc.

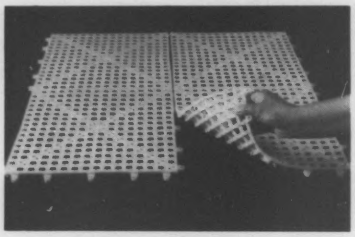
Purity Dairies, Inc., Nashville, Tennessee and Bancroft Dairy - Div. of the Southland Corp., Madison, Wisconsin were also cited for cultured foods quality excellence.

According to Institute Vice President/Secretary, Dr. C. Bronson Lane, the conclave drew close to 300 individuals from the United States, Canada, Mexico, and the Republic of Panama.

Dr. Larry McKay (center), University of Minnesota, was recipient of the 1985 ACDPI Research Award (sponsored by Nordica Int.) at the recent Institute confab in Nashville, Tennessee. The award consists of a permanent plaque and $1,000.

Pictured (L to R) with Dr. McKay are: Dr. Frank Kosikowski (former Research Award recipient), Cornell University; Fran Lavicky, Nordica Int.; Jeff Edwards (ACDPI Assistant Secretary), The Kroger Co.; Glenn Witte (ACDPI President), MIF.

The products included herein are not necessarily endorsed by Dairy and Food Sanitation.



Dri-Dek Tiles

Dri-Dek Parlor Pit Floor Covering

• Dri-Dek parlor pit floor covering offers two benefits in one floor covering - fatigue relief, plus protection against wet floors. For wet areas, Dri-Dek's flow through surface drains fluids and dirt and allows fresh air to circulate below its anti-bacterial surface so that parlor pit floors stay dry and odor free.

Dri-Dek comes in 12x12x9/16" tiles that interlock to form any size portable surface over any level or unlevel floor.

For free sample, brochure and prices call TOLL FREE 1-800-348-2398 (or in Florida call collect 813-774-4808). Or write Kendall U.S.A., P.O. Box 8839, Naples, FL 33941.

Please circle No. 290 on your Reader Service Page

Pettibone Chemicals Offers New Line of Citrate Plasticizers

• Pettibone Chemicals, Chicago, IL manufacturer and distributor of specialty chemicals, now offers a full line of citrate plasticizers for polyethylene, polypropylene and polyvinyl chloride products.

The new chemicals are non-toxic and odorless, and therefore especially suited for use in such products as food and meat contact films; foil and paperboard coatings; bottle and jar seals and flexible tubing. They also are said to impart superior transparency, softness and flexibility.

Four products for various applications are available: tributyl citrate (TBC), acetyl tributyl citrate (ATBC), acetyl triethyl citrate (ATEC), and triethyl citrate (TEC). TEC also has applications as a flavor retained in egg yolks. Laboratory samples are immediately available on request from: Pettibone Chemicals, 435 N. Michigan Avenue, Chicago, IL 60611, 312-944-0777.

Please circle No. 291 on your Reader Service Page

Food Grade Silicones Listed In Fact File From GE

• A new fact file published by General Electric Company provides data on silicones which meet federal food and drug regulations, according to the manufacturer. The publication includes an index to identified grades of indirect food additives under current federal regulations.

In addition, the file includes product selector guides and product data sheets for GE antifoams, fluids and emulsions, as well as heat curable and room temperature vulcanizing rubber compounds used in food processing and packaging.

Silicones are a group of materials, quite different from other materials, whose properties permit them to perform in many far-ranging applications. Chemically inert, relatively stable at high and low temperatures, resistant to ultraviolet rays and ozone, their application has resulted in many processing and product improvements. As antifoams in food processing, for example, they can be used in relatively small amounts to control foam, thus helping to speed production and reduce production costs. As resins, their release characteristics make them ideal as release coatings in food packaging. As elastomers, they can be used as fabricated rubber components in the production line.

Besides providing product properties information, the silicones Fact File offers application suggestions and materials handling information. It is available by contacting General Electric Company, Silicone Products Division, Waterford, NY 12188.

Please circle No. 292 on your Reader Service Page

Relative Humidity Temperature Indicators from Testoterm

• Testoterm, Inc., experts in highly crafted hand held instruments for measuring temperature, relative humidity and air velocity, announces a complete line of hygrotest® Relative Humidity/Temperature indicators, probes and accessories.

Periodic checks with the Testoterm field calibration kit will make the hygrotest® RH instrument an in-house standard. No more costly out-of-house verification.

Interchangeable probes designed for immersion, surface and penetration applications, provide an instant response in the range of 5% to 98% RH and from -199°F to +199°F temperature, displayed by 0.5" high black digits. The 9V battery powered hygrotest® 6400 weighs only 9 ounces and carries a one year warranty.

hygrotest® instruments are used to monitor many types of environments including production storage such as grain, paper, leather, fruits and vegetables; in greenhouses; EDP rooms; libraries; warehouses; printing facilities; cloth manufacturing; and for energy saving climatization in buildings.

For more information contact: Testoterm, Inc., P. O. Box 468, Mount Freedom, N. J., 07970. 201-989-8869.

Please circle No. 293 on your Reader Service Page

Leprino Foods Co. Shipping Sack

Newly Designed Multiwall Shipping Sack

• Leprino Foods Company is using a newly designed multiwall shipping sack from Champion International to package the humidity-sensitive whey protein concentrate it exports.

Tailored to meet strict export requirements, the bag provides safe, strong, economical protection for a product much favored overseas as a component of baby formula, popular beverages, snack food bars and processed cheese, the company says.

Engineers at Champion's multiwall bag operation developed the bag primarily to improve the closures and to help Leprino Foods preserve and prevent discoloration of the food-grade product and resist breakage and puncturing.

Overall savings of six percent on sack cost, spillage, freight and product deterioration have been reported by Leprino Foods as the result of switching to the new bag construction, according to David Kielsmeier, plant manager.

Shelf life tests have established that the new bag will prevent discoloration of whey protein concentrate stored six weeks at 100 degrees F at 98 percent relative humidity.

Moreover, the lighter basis weight Stress Kraft paper sack offers more flexibility in the filling and handling of Leprino's product during the packaging operation.

For more information contact: Leprino Foods Company, P.O. Box 8400, 1830 W. 38th Avenue, Denver, Colorado 80201. 303-480-2600.

Please circle No. 294 on your Reader Service Page

NEM Video Training Courses

1985 NEM Catalog Released

• National Educational Media, Inc. has just released its new 1985 catalog describing over 140 programs and 16 new, self-contained course packages.

"We're extremely enthusiastic about new developments reflected in the catalog this year," says NEM president, Jack Copeland. "Recent rapid changes in training and education have challenged everyone. NEM has met the challenge with new courses, new productions, and completely updated versions of many of our most popular programs."

Among the new programs detailed in the catalog is "Six Keys to Service," starring Emmy Award-winning TV host, Peter Marshall. "We believe this is one of the most powerful programs ever made on the subject of service," Copeland states. "It provides valuable insight into interpersonal relations and communications for anyone whose job involves serving the public."

Revised versions of the three programs in the much-requested "Kitchen Safety Series" are also available.

As part of an ongoing effort to provide state-of-the-art foodservice training, NEM has also released "Alcohol Server Responsibility," starring Vic Tayback, from the popular TV series, "Alice." The 18-minute program uses an easy-to-learn three step approach to help employees prevent guest intoxication.

Study Material Kits with student study guides and tests, lesson plans and leader's guides are available with each NEM audiovisual program. The kits increase student involvement and reinforce learning retention, while reducing instructor preparation time and costs.

All NEM programs are available in a variety of film and video formats in as many as 12 languages. Programs may be purchased or rented. Previews are available at no charge to schools and at a minimal charge (applicable to purchase within 30 days) to other institutions. A number of cost-effective purchase/lease options are described in the catalog.

Copies of the 1985 General Film/Video Catalog may be obtained without charge by contacting National Educational Media, Inc. 21601 Devonshire Street, Chatsworth, California 91311, or phone 818-709-6009. In Canada, contact Omega Films, Ltd., 70 Milner Ave., Unit #5A, Scarborough, Ontario M1S 3P8 Canada; phone 416-291-4733.

Please circle No. 295 on your Reader Service Page

Food Science Facts
For The Sanitarian

Robert B. Gravani
Cornell University
Ithaca, NY

FOOD DETERIORATION AND SPOILAGE BY RODENTS (continued from the May issue)

Rodents have one thing in common - strong, well developed front teeth called incisors. These four teeth grow six inches in length a year and the rodent must gnaw and chew to wear them down. The enamel on a rodent's incisors is extremely hard and is often compared to the hardness of a steel blade of a pocket knife. When rodents gnaw and chew, they exert a force of about 24,000 pounds per square inch!

With these strong jaws and teeth, rodents can successfully gnaw on a variety of materials including wood, plaster, plastic, aluminum, lead pipe, cinder blocks, porous concrete, soft rubber, cardboard, paper and cloth materials. These animals have a space between their teeth on each jaw. They can draw their lips into this space to prevent dirt, wood shavings and other materials from getting into their mouths as they gnaw. In gnawing and chewing, they can gain entrance into a food plant, warehouse, retail store or restaurant; they also gnaw and chew to reach a source of food.

PHYSICAL ABILITIES

The physical abilities of rodents are amazing and almost unbelieveable.

Norway rats can:

- Jump vertically about 3 feet from a flat surface;
- Jump horizontally about 4 feet on a flat surface;
- Drop 50 feet without serious injury;
- Climb horizontal and vertical wires;
- Climb brick or other rough exterior walls that provide foodholds:
- Gain entry to buildings through an opening larger than 1/2 square inch;
- Burrow vertically into soil to a depth of 4 feet;
- Swim as far as 1/2 mile in open water, tread water for 3 days; dive through water plumbing traps, and travel in sewer lines, even against substantial water currents;
- Climb vines, shrubs, trees and can travel along telephone or power lines;
- Climb inside vertical pipes (1 1/2 - 4 inches in diameter);
- Climb outside vertical pipes up to 3 inches in diameter; and
- Climb the outside of any size vertical pipe that is within 3 inches of a wall or other support.

House Mice Can:

- Vertically jump 12 inches;
- Run up almost any vertical rough-surface material that provides a foothold;
- Run along horizontally suspended insulated wires, cables and ropes;
- Pass through openings only slightly larger than 1/4 inch in diameter;
- Move, hanging upside down from 1/4 inch hardware cloth;
- Swim when necessary;
- Walk or run along narrow ledges;
- Jump from a height of 8 feet without injury; and
- Survive subfreezing temperatures given ample food and nesting material.

FEEDING HABITS AND MOVEMENT

Rats are steady eaters, they settle down and consume large amounts of food at one time. If food is in open areas or too large to be easily eaten, rats may drag it to a sheltered area before consuming it. Rats are often known to store food for later consumption - they require water each day, either in their food or as free water.

Mice are nibblers, eating a bit of food here and there. They require very little water and may survive long periods without it. Mice have two primary feeding times each day - at dusk and just before dawn. In between these times, they eat sporadically.

Rodents become very familiar with their environment and know every inch of it very well. Rats and mice have poor vision and rely on their senses of smell, taste, touch and hearing. They rely on these senses to learn about

their environment, locate food and recognize potential mates. Rodents have very sensitive whiskers and specialized hairs on their bodies called guard hairs. They keep these whiskers and guard hairs in contact with walls and other objects as they move through an establishment. In this way, the rodent learns every nook and cranny and can escape to a safe harborage in time of danger.

Rats are very cautious about new objects or investigate them very cautiously. They may detour through a previously well traveled area to avoid a trap or new food. After several days they become "more comfortable" with the object and begin to explore it. This habit has contributed greatly to the rats' ability to survive many environments. Mice, on the other hand, are highly inquisitive and may get caught because of this curiosity. Rodents living in a constantly changing environment, like dumps, are less afraid of new objects than those where changes rarely occur.

A rat sheds about 500,000 to 1 million hairs in a year. They frequently groom themselves and ingest hair in this process. More than 300 hair fragments are present in each dropping. These droppings are found in well traveled areas and also in large amounts in protected areas. The hair shed from the body and in crushed droppings can be carried by air currents to food products in the plant. A rat dribbles about 1 pint of urine a month and produces about 25,000 droppings a year.

RODENT CONTROL

Rodents invade food establishments in search of food and shelter. A well planned program is needed to provide effective rodent control.

To control rodents, the following items must be accomplished:

1) Keep Them Out - Rodent Proof Your Establishment
   - Seal all external openings to the building
   - Screen all windows, floor drains, etc.
   - Keep doors closed
   - Make sure thresholds seal properly against doors
2) Eliminate Hiding Places
   - Keep the establishment neat and clean
   - Don't allow debris, old pallets, crates, unused equipment and other material to build up
   - Keep garbage covered and the area around it clean and free of litter
   - Keep grass, shrubs and landscaping outside of building neat and trimmed.
3) Eliminate Food - Starve Them
   - Keep food storage areas neat, clean and free of spills
   - Store open foods in properly constructed, covered containers
   - Keep stored foods off the floor and away from the walls
   - Discourage employees from eating in the plant or warehouse

Rodents cause tremendous losses in the food industry each year. Proper sanitation, knowledgeable employees and an effective rodent control program are the best ways to prevent these losses.

NOTICE TO MEMBERS OF IAMFES

Resolutions that need to be brought up at the 72nd Annual Meeting in Nashville should be sent to:

Dr. A. Richard Brazis, Resolution Chairperson
1006 Martin Drive W
Bellevue, Nebraska 68005

Please submit before July 20, 1985

Dairy Quality

by **Darrell Bigalke,** *Food & Dairy Quality Mgmt., Inc., St. Paul, MN*

PLANNING FOR PRODUCTION OF QUALITY DAIRY PRODUCTS

Last month's *Dairy Quality Update* Newsletter pointed out that improvement of product quality can be a source of increased profits. The objective was to point out that determining the profits that a quality improvement program might generate can be a real help in managing process quality. In addition, the newsletter emphasized that the cost of quality is really the expense of doing things wrong.

The intent of this month's newletter is to point out that planning is essential in the production of quality dairy products. The purpose of planning is to facilitate the accomplishment of objectives. If a corporation has established the production of quality dairy products as an objective, effective planning is necessary. A type of planning that can be used to accommodate this need is the development of a quality improvement program. Programs are a complex of goals, policies, procedures, rules, tasks and responsibilities assigned, steps to be taken, resources to be applied, and other elements necessary to carry out a given course of action. In addition, programs must be supported by necessary capital and operating budgets.

Initiation of a quality improvement program can be thought of as a type of planning. The importance of this type of planning is the accomplishment of four objectives:

1. to off-set uncertainty and change,
2. to focus attention on objectives,
3. to gain an economical operation, and
4. to facilitate control.

To determine the effectiveness of the quality improvement program, the current product quality must be measured. Current shelf-life, percent of products with defects, and other parameters must be documented. This data will serve as a basis for measuring product quality improvement and establishing product specifications.

The approach for a quality improvement program should be quality improvement through "defect prevention." Unfortunately dairy products are quite susceptible to many biological factors that can result in product defects. Many of the biological factors affecting quality can be difficult to identify and control. Therefore, controlling biological factors as well as non-biological factors affecting quality requires careful planning, including:

1. establishing goals based on product specification,
2. establishing quality control policies,
3. promulgating written procedures, and
4. developing a control system based on continuous and effective ingredients and process monitoring.

Objectives or goals are the ends toward which an activity is aimed. To facilitate proper planning, measurable objectives based on product standards need to be established. For example: a fluid milk plant may wish to establish, as a goal, milk shelf-life of twenty-one days. This requires milk samples be held for twenty-one days for sensory and microbiological evaluation. Objectives must be established for other dairy products.

For example: a cottage cheese manufacturer may establish an objective of twenty-eight-day shelf-life and/or samples stored for ten days at 45F, with psychrotrophic bacterial populations less than 10/g as an indication of long shelf-life. Just as a company will set sales objectives or sales goals, establishing quality goals are necessary to manage the production of quality dairy products.

Establishing policies is another important parameter in a quality improvement program. Policies pre-describe the limits of a given parameter. For example, a policy may be established that no milk will be received at the dairy plant that exceeds a temperature of 42F. Establishing policies of this type pre-describe an issue and give a unified structure and order to plant functions. Policies also permit management to delegate authority while maintaining control. Establishing policies for receiving temperatures, storage and distribution temperatures should be considered an essential part of a quality improvement program. Other policies concerning conditions of ingredient storage, microbiological specification, packaging, and other factors affecting quality should be established. Equally important is the enforcement of these established policies.

Development of a quality improvement program must also include establishing processing procedures. Procedures are plans in that they establish a customary method

of handling activities. An effectively operating quality program would include a quality control manual consisting of written procedures. Written procedures should be established for receiving, production, sanitation, maintenance schedules, testing, and other functions necessary for the production of quality products. Written procedures in each of these areas establish a chronological sequence of required actions that are necessary for the production of quality dairy products.

Establishing a control system is another necessary function in the development of a quality improvement program. The primary function of the control system is to recognize and correct deviations from established standards, policies, and procedures. Examples of functions of the control system might include:

1. Measuring and recording storage temperatures.
2. Daily reviewing of data from line sequence analysis to identify sources of post-process contamination leading to product defects.
3. A system of documenting the effectiveness of the sanitation program including:
   a. reviewing CIP charts,
   b. measuring temperatures and concentrations of detergent solutions,
   c. measuring concentrations of sanitizing solutions,
   d. visual inspection of product contact surfaces.
4. A system of documenting process control procedures.
5. Conducting supplier audits.
6. Establishing training programs.
7. Other "feedback" systems needed to control systems, policies, and procedures.

Most dairy products are very susceptible to product defects. Effectively operating quality control programs are needed to prevent these defects. Effective planning will help manage the dairy's quality control program.

AIRLINE FOOD SAFETY RAISES CONCERNS

Serving thousands of people a day while winging through the skies is, to say the least, a tough challenge. The food has to be prepared and held on the ground, transferred at a specified time to the aircraft, and then stored until meal time. Sometimes the food has to be heated before it is served.

The In-flight Food Services Association, an organization of caterers serving the airlines, estimates that 150 million meals are served each year to people who are hurtling through U.S. skies on heavier-than-air craft. That's equal to serving a meal each day to the entire population (432,000) of Tulsa, Oklahoma.

Serving such a volume when the kitchen has been left miles behind can result in some problems. And it has. Last March the worst airline foodborne illness situation in history occurred, when some hundreds and probably thousands of passengers flying on British Airways were stricken. Many were hospitalized.

The danger of foodborne illness was further exemplified by the results of FDA inspections last July of aircraft carrying food for in-flight meals. In a letter to the major airline presidents telling the results of those investigations, FDA said "serious, potentially hazardous problems" were uncovered.

The problems apparently exist for two reasons: improper preparation, handling and storage of foods; and airline traffic congestion resulting in flight delays that cause meals to sit for long periods. The congestion problem is due in part to increased air traffic. The Air Transport Association says that the number of passengers carried on U.S. airlines has more than doubled in the past 10 years, to over 300 million a year.

Three other factors have added to the congestion/food sanitation problem: (1) with the airlines deregulated, they have squeezed more flights into the popular rush hours of early morning and late afternoon; (2) the number of air traffic controllers is still down from the pre-1981 days before they went on strike; and (3) the airlines have gone more and more to spoke and hub routing in which flights are fed to a central airport, or hub, for connections.

Food loaded on aircraft has to be held at proper hot or cold temperatures until it is served. The temperatures that encourage bacterial growth range from 45 to 140 degrees Fahrenheit; this is called the "danger zone," according to FDA's Food Service Sanitation Code.

In its July inspections, FDA personnel in the New York metropolitan area concentrated their investigations at Newark, La Guardia and John F. Kennedy airports. In a three-week period, five investigators inspected from two to 17 aircraft from each of 25 airlines. To include flights covering vacation as well as business travelers, the investigators checked planes slated for quick turn-around trips as well as equipment scheduled for long-haul trips in which more than one meal would be served.

All the inspections were performed after the aircraft had been serviced - that is, after wastes from lavatories and refuse from galleys had been removed and fresh water and meals from the caterer had been put on board. The problems were not limited to potentially dangerous food temperatures; inspectors also found aircraft that had been improperly cleaned between flights.

A total of 166 aircraft were checked. Of the 142 (from 19 airlines) with food on board, 20 percent - or 28 aircraft from 10 airlines - had foods, including meals, milk and non-dairy creamers, held at improper or uncontrolled temperatures.

Among specific abuses that were found:

-On a plane scheduled for a flight from Newark to Fort Lauderdale, Fla., the internal temperature of steaks was 59 degrees - within the danger zone. The steaks had been "stored" in a warm oven (about 75 degrees), which had not been cooled from a previous flight.

-Three turkey meals for the crew with internal temperatures of 62 to 68 degrees and appetizers for the crew at 70 degrees were found on a plane scheduled to fly from JFK through Chicago to Los Angeles.

-Some meals were not packed in dry ice, a particularly worrisom situation in mid-summer when the inspections were made. For a Newark to Dallas flight, 12 meals were checked and were found to have been put on board with temperatures of 68 to 72 degrees.

-For a plane destined for Denver from Newark, a fish entree had an internal temperature of 110 degrees.

-Steak and chicken entrees with temperatures of 66 to 70 degrees were on a craft scheduled for a LaGuardia, N.Y., to Chicago flight.

-General sanitation problems included dirty lavatories and trash compartments within galleys. The food particles, soiled paper cups, and soiled napkins found in the facilities could contaminate areas in which food is stored.

That delays contributed to the problems seems of little doubt. Late departures can give bacteria the time and temperature they need to grow on meals not chilled well enough for such a long sit.

The temperature problem is further complicated when an airline practices "double-meal boarding," in which meals for long flights or both the plane's outbound and return flights are stocked at the same time. Many of these round-trip flights can last 10 hours, and the chance for foodborne illness greatly increases the longer the food sits at improper temperatures. In one inspection of a plane that used "double-meal boarding", the meals were in a refrigerator that was clearly marked "IN OP", or inoperable.

While the July inspections concentrated on food held on aircraft, similar problems have been uncovered in the past in FDA inspections of kitchens serving the airlines.

Immediately after the July inspections, FDA sent Notices of Adverse Findings letters to the airlines where problems were found. These letters pointed out the conditions found in the inspections. The airlines were requested to respond in writing on the actions they were taking to improve the situation. The letter resulted in requests from the airlines for meetings with agency officials.

A second letter sent to all domestic airline presidents telling of the "serious, potentially hazardous" problems was also made available to airline and catering trade associations. The letter solicited their assistance in publicizing the problems as widely as possible to airline management and workers, and to airline trade press.

Also planned are additional inspections at other U.S. airports to see if the conditions found in New York are prevalent elsewhere. FDA has offered to participate in airline industry seminars and association meetings to discuss the problems uncovered during the New York inspections and is working in conjunction with Cornell University and the In-Flight Food Services Association to educate airline personnel and catering firms

on correcting and avoiding the problems. (Donald C. McLearn and Roger W. Miller, FDA Consumer, Feb. 1985)

MEASLES ON A COLLEGE CAMPUS - OHIO

Between January 15, and February 9, 1985, 12 confirmed cases of measles among students at The Ohio State University have been reported to the Ohio Department of Health. Two cases have been serologically confirmed. The index case is a senior student who acquired measles while traveling to London and Sierra Leone between December 8, 1984, and January 5, 1985. His rash onset was January 15; he subsequently infected four additional students. To date, students in one fraternity, one sorority, and three dormitories have been infected. In addition, several students in a brother fraternity at neighboring Miami University of Ohio have been exposed to a potentially infectious student from The Ohio State University.

The student health service, assisted by the Ohio Department of Health, has initiated several control measures, which include: (1) holding voluntary vaccination clinics in affected dormitories and at the student health clinic; (2) publicizing the outbreak on campus and in the surrounding community; and (3) increasing surveillance on campus and in the surrounding community. To date, 500 doses of vaccine have been administered to the student body, which consists of approximately 50,000 students. Additional clinics are planned for fraternity and sorority members.

EDITORIAL NOTE: Measles outbreaks on college campuses have been reported with increasing frequency in recent years. In 1980, 1.5% of all reported cases occurred on college campuses, compared with 19.8% of all cases reported in 1983. In 1984, one large outbreak in New Hampshire involved 29 students or their family contacts at Dartmouth College, the community, and patients and staff at the community hospital. The current outbreak has already involved three generations, and additional spread seems likely.

The propensity of measles to spread among college students is related to several factors, the most important of which include: (1) many college-aged students may have missed measles vaccination in the first years following licensure of measles vaccine; (2) college students tend to congregate in large groups (e.g., dormitories, fraternities and sororities, and social and sporting events); and (3) many colleges and universities lack immunization requirements. Since approximately 5% - 15% of college-aged individuals are currently susceptible to measles when tested serologically, college campuses effectively become a gathering place where large pools of susceptibles congregate. Any introduction of measles virus is likely to spread easily in such a susceptible population.

Measles outbreaks on college campuses are costly and disruptive. It is estimated that the Dartmouth outbreak cost over $30,000 to control. The direct costs of controlling the 1983 outbreak at Indiana University at Bloomington exceeded $225,000.

Because it is more cost-effective to prevent measles outbreaks than to attempt to control them, in May 1983, the American College Health Association adopted a preadmission immunization policy recommending that, by September 1985, colleges and universities require all students born after 1956 to present documentation of immunity to measles and other vaccine-preventable diseases before matriculation. A similar recommendation was made in 1980 by the Immunization Practices Advisory Committee. Several universities have already implemented such policies. In Mississippi, students registering for the first time at state-supported 4-year colleges and universities are required to furnish proof of immunity to measles and rubella. Currently, neither The Ohio State University nor the other affected colleges in Ohio have immunization requirements for matriculating students. (MMWR 2/22/85)

William Byrne, Jr.
Byrne Dairy Inc.
Syracuse, NY

Henry E. Crouch
Queensboro Farm Prod, Inc.
Canastota, NY

David DePasquale
Bactomatic, Inc.
Princeton, NJ

Donald F. George
Vermont Dept. of Agric.
Montpelier, VT

Dorthea Jo Manning
Horseheads, NY

David R. Post
Alfred, NY

Howard J. VanBuren
Painted Post, NY

Charles A. Yarris
McCadam Cheese Co.
Chateaugay, NY

Paul R. Kindstedt
Dept. of Food Science
Ithaca, NY

Frank Kosikowski
Dept. of Food Science
Ithaca, NY

Joe Weitman
Sunnydale Farms
Brooklyn, NY

Ted Westmeier
Livingston Co Health Dept.
Howell, MI

Jennifer Holt
Minn. Dept. of Agric.
Chaska, MN

Stan Peroutka
Minn. Dept. of Agric.
Faribault, MN

Daryl Piltz
Minn. Dept. of Agric.
Minn. Lake, MN

Douglas R. Prantner
The Kendall Company
Litchfield, MN

John Rasmussen
Rasco Universal
Albert Lea, MN

Donald Turnbull
Rasco Universal
Albert Lea, MN

Marlin H. Abbott
Minn. Dept. of Agric.
Lake Crystal, MN

Donald R. West
Minn. Dept. of Agric.
Burtrum, MN

James Saulters
Wetterau Inc
Milton, WV

Marlene Petersen
Merrick Foods
Union Center, WI

Members

J. Carroll Sellers
Nashville, TN

Robert Blake
Saginaw Co Health Dept.
Saginaw, MI

Ann C. Miners
Gen. Foods Mfg. Corp.
Modesto, CA

Robert H. Schmoll
AMPI
New Ulm, MN

Neal J. Scott
Minn. Dept. of Agric.
New Richland, MN

Mary Jane Pettis
AMPI
New Ulm, MN

Carl M. LaFrate
Prosan Associates
Liverpool, NY

Fritz Buss
Nelson-Jameson, Inc.
Marshfield, WI

Timothy McIver
Universal Dairy Equip. Co.
Mankato, MN

Richard D. Grass
Beatrice Cheese, Inc.
Faribault, MN

Donald R. Goldsmith
Minn. Dept. of Agric.
Wabasso, MN

Nicholas V. Kunkel
Universal Dairy Equip.
Faribault, MN

Everett J. Wall
Grid Laboratories
St. Paul, MN

Keith Gartner
Wisconsin Dairies
Preston, MN

Robert O. Bluck
Wisconsin Dairies
Preston, MN

Robert Darrah
Safeway Stores Inc.
Oakland, CA

Dr. Thomas M. Gilmore
Harrisburg, PA

Donald E. Lord
Foremost Dairies Inc.
Lemoore, CA

David L. Parrish
Mid-Am Dairymen, Inc.
St. Paul, MN

John P. Kelley
Mich Dept. of Pub Health
Pinckney, MI

Corinne R. Sharpe
Lenawee Co Health Dept.
Adrian, MI

Pasca P. DeLaguis
Applied Microbiology Food Science
Saskatoon, Canada

John Hardy
The Pillsbury Co.
Belvidere, Il

3-A Sanitary Standards for Milk and Milk Products Evaporators and Vacuum Pans

Number 16-05

Formulated by
International Association of Milk, Food and Environmental Sanitarians
United States Public Health Service
The Dairy Industry Committee

It is the purpose of the IAMFES, USPHS, and DIC in connection with the development of the 3-A Sanitary Standards program to allow and encourage full freedom for inventive genius or new developments. Milk and milk products evaporators and vacuum pan specifications heretofore or hereafter developed which so differ in design materials, and construction, or otherwise, as not to conform to the following standards but which, in the manufacturer's or fabricator's opinion, are equivalent or better, may be submitted for the joint consideration of the IAMFES, USPHS, and DIC at any time.

A.

SCOPE

A.1

These standards cover the sanitary aspects of evaporators and vacuum pans used for milk and milk products.

A.2

In order to conform with these 3-A Sanitary Standards, evaporators and vacuum pans shall comply with the following design, material, and fabrication criteria.

B.

DEFINITIONS

B.1

Product: Shall mean milk and milk products.

B.2

Evaporators and Vacuum Pans: Shall mean equipment in which products may be concentrated in vacuo.

B.3

Evaporators: Shall mean equipment in which the heat exchange surface is not located within the vapor-liquid separation chamber.

B.4

Vacuum Pans: Shall mean equipment in which the heat exchange surface is that of a steam jacket and/or a series of steam coils or other heating surfaces within the vacuum chamber.

B.5

Product Contact Surface: Shall mean all surfaces that are exposed to the product, or from which liquid may drain, drop, or be drawn into the product.

B.6

Non-Product Contact Surface: Shall mean all other exposed surfaces.

B.7

Mechanical Cleaning or Mechanically Cleaning: Shall denote cleaning, solely by circulation and/or flowing chemical detergent solutions and water rinses onto and over the surfaces to be cleaned, by mechanical means.

C.

MATERIALS

C.1

All product contact surfaces shall be of stainless steel of the AISI 300 series[1] or corresponding ACI[2] types (See Appendix, Section E), or equally corrosion resistant metal that is non-toxic and non-absorbent, except that:

C.1.1

Rubber and rubber-like materials may be used for gaskets, seals, O-Rings and parts having the same functional purposes. These materials shall comply with the applicable provisions of the "3-A Sanitary Standards for Multiple-Use Rubber and Rubber-Like Materials Used as Product Contact Surfaces in Dairy Equipment, Number 18-00."

C.1.2

Plastic materials may be used in sight and/or light openings and for gaskets, seals, scraper blades and parts having the same functional purposes. These materials shall comply with the applicable provisions of the "3-A Sanitary Standards for Multiple-Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment, Number 20-13."

C.1.3

The final bond and residual adhesive, if used, of bonded rubber and rubber-like materials and bonded plastic materials shall be non-toxic.

C.1.4

Bonded rubber and rubber-like materials and bonded

---

[1]*The data for this series are contained in the following reference: AISI Steel Product Manual, Stainless & Heat Resisting Steels, Dec. 1974, Table 2-1, pp. 18-19. Available from: American Iron & Steel Institute, 1000 16th St., N.W., Washington, DC 20036.*

[2]*Alloy Casting Institute Division, Steel Founders' Society of America, Cast Metals Federation Bldg., 455 State Street, Des Plaines, IL 60016.*

plastic materials having product contact surfaces shall be of such composition as to retain their surface and conformation characteristics when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment.

C.1.5

Glass may be used in sight and/or light openings and shall be of a clear heat resistant type.

C.2

Non-product contact surfaces shall be of corrosion-resistant material or material that is rendered corrosion-resistant. If coated, the coating used shall adhere. Non-product contact surfaces shall be relatively non-absorbent, durable and cleanable. Parts removable for cleaning, having both product contact and non-product contact surfaces, shall not be painted.

D.

FABRICATION

D.1

Product contact surfaces shall have a finish at least as smooth as a No. 4 ground finish on stainless steel sheets and be free of imperfections such as pits, folds and crevices in the final fabricated form. (See Appendix, Section F.)

D.2

Permanent joints in metallic product contact surfaces shall be welded, except that tubes may be either expanded and rolled or welded into tube sheets or distributor plates. Welded areas on product contact surfaces shall be at least as smooth as a No. 4 ground finish on stainless steel sheets free of imperfections such as pits, folds and crevices. When tubes are expanded and rolled into tube sheets and distributor plates, the resulting joint shall be completely rigid and without pockets or crevices. All joints, except for distributor plates with protruding tubes, shall be flush.

D.3

Product contact surfaces designed to be mechanically cleaned shall be accessible for inspection.

D.3.1

Product contact surfaces not designed to be mechanically cleaned shall be easily accessible for cleaning, and inspection either when in an assembled position or when removed. Removable parts shall be readily demountable.

D.3.2

A vacuum pan, to comply with the requirements of this section, shall have spaces between coils at least as great as the following:

Between coils – 2½ inches;

Between coils and vacuum pan walls – 3 inches;

Between coil banks – 3½ inches;

D.3.3

A product heater designed to be mechanically cleaned in which the heat exchange surface is one continuous tube shall be considered to be in compliance with the requirements of this section.

D.4

Evaporators and vacuum pans that are to be mechanically cleaned shall be designed so that the product contact surfaces of the evaporators and vacuum pans and non-removable appurtenances thereto can be mechanically cleaned.

D.5

Product contact surfaces except heaters, pumps and pertinent sanitary piping shall be self-draining except for normal clingage. Heaters, pertinent sanitary piping and pumps shall be drainable.

D.6

All internal angles of 135° or less on product contact surfaces shall have minimum radii of ¼ inch, except that:

D.6.1

Minimum radii for fillets of welds in product contact surfaces may be ⅛ inch where the thickness of one or both parts joined is less than 3/16 inch.

D.6.2

Where smaller radii are required for essential functional reasons such as rolled gas tubes in distributor plates and distributor and support pins, such joints shall be readily accessible for cleaning and inspection.

D.6.3

The minimum radii in gasket grooves or gasket retaining grooves other than those for standard ¼ inch and smaller O-Rings shall be not less than ⅛ inch.

D.6.4

The minimum radii in grooves for standard ¼ inch O-Rings shall be not less than 3/32 inch and for standard ⅛ inch O-Rings shall be not less than 1/32 inch.

D.7

Gaskets having product contact surfaces shall be removable or permanently bonded to the surface. Any gasket groove or gasket retaining groove, except in the bonded area, shall be no deeper than its width and shall not exceed ¼ inch in depth or be less than ¼ inch wide except that:

D.7.1

Grooves for cover gaskets shall be no deeper than their width and the minimum radius of any internal angle shall not be less than ⅛ inch.

D.7.2

In grooved gaskets, the length of the shorter leg shall not exceed twice the width of the groove, the minimum width of the groove being ¼ inch and the maximum depth ½ inch.

D.8

All gasket grooves and gasket retaining grooves for removable gaskets shall be readily cleanable.

D.9

Bonded gaskets shall be bonded in a manner that the bond is continuous and mechanically sound, and when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment, the rubber or rubber-like material does not separate from the base material to which it is bonded.

D.10

The product heat exchange tubing shall comply with

the "3-A Sanitary Standards for Polished Metal Tubing for Dairy Products, Number 33-00."

D.10.1

Tubular heat exchangers when incorporated into an evaporator shall comply with the "3-A Sanitary Standards for Tubular Heat Exchangers for Milk and Milk Products, Number 12-04."

D.11

Where the evaporative heat exchange surface is of the plate type, the plate equipment shall comply with the applicable provisions of the "3-A Sanitary Standards for Plate Type Heat Exchangers for Milk and Milk Products, Number 11-03", except for the provision of paragraph D.7 of the aforementioned standards.

D.11.1

Where the evaporative heat exchanger surface is of the scraped surface heat exchanger type, the equipment shall comply with the applicable provisions of the "3-A Sanitary Standards for Scraped Surface Type Heat Exchangers for Milk and Milk Products, Number 31-01."

D.12

Pipe connections in product contact surfaces, vacuum breakers, valves and sampling valves shall conform to the applicable provisions of the "3-A Sanitary Standards for Fittings Used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products, Number 08-17 Rev." and/or the applicable provisions for welded sanitary product-pipelines found in the "3-A Accepted Practices for Permanently Installed Sanitary Product-Pipelines and Cleaning Systems, Number 605-02."

D.13

Sight and light openings, when provided, shall be of such design and construction that the inner surfaces drain inwardly, and if the evaporator or vacuum pan is designed for mechanical cleaning, the inner surface of the glass or plastic shall be relatively flush with the inner surface of the evaporator or vacuum pan. The exterior flare shall be pitched so that liquids cannot accumulate. The glass or plastic shall be readily removable. The inside diameter of the opening shall be at least 3¾ inches.

D.14

Instrument connections, when provided in product contact surfaces, shall conform to "3-A Sanitary Standards for Instrument Fittings and Connections used on Milk and Milk Products Equipment, Number 09-07."

D.15

The minimum inside diameter of a manhole shall be 16 inches.

D.16

The cover for a manhole shall be of the outside swing type. Unrestricted access to manholes and inspection ports by means of a ladder or platform shall be provided.

D.17

Openings, when provided, for vacuum breakers and sampling valves shall be in a product contact surface.

D.18

There shall be no threads on product contact surfaces.

D.19

All exhaust vapor lines beyond the product contact surface shall drain away from the product contact surface. A pitch of at least ⅜ inch per foot to the first vertical drop or a condensate drain connected to a higher vacuum source shall be provided.

D.20

Vacuum gauge connections shall be placed in the vapor line beyond the product contact surface.

D.21

Non-product contact surface shall be smooth, free of pockets and crevices and be readily cleanable and those to be coated shall be effectively prepared for coating.

D.22

Supporting structures, braces, cat walks, stairs, handrails and guards are considered as part of the building structure, i.e. walls, ceilings, floors, and are not considered non-product contact surfaces for this equipment.

D.23

An automatic condenser water level control for preventing water from entering the product shall be provided by one of the following means:

D.23.1

A barometric leg extending at least 35 feet verticially from the maximum safe water level in the condenser system to the free water level at which the leg discharges, less 1 foot vertical height for each 1200 feet of elevation above sea level, or

D.23.2

A surface condenser in which the vapor and the condensing water are separated by metal walls and do not come into contact with each other, or

D.23.3

A safety shut-off valve located in the water feed line to the condenser, automatically actuated by a control which will shut off the inflowing water when the water level rises above a predetermined point in the condenser. This valve may be actuated by water, air or electricity, and shall be so designed that failure of the primary motivating power will automatically stop the flow of water.

APPENDIX

E.

STAINLESS STEEL MATERIAL

Stainless steel conforming to the applicable composition ranges established by AISI for wrought products, or by ACI for cast products, should be considered in compliance with the requirements of Section C.1 herein. Where welding is involved the carbon content of the stainless steel should not exceed 0.08%. The first reference cited in C.1 sets forth the chemical

ranges and limits of acceptable stainless steels of the 300 series. Cast grades of stainless steel equivalent to types 303, 304 and 316 are designated CF-16F, CF-8, and CF-8M, respectively. These cast grades are covered by ASTM[3] specifications A296-67 and A351-65.

F.

PRODUCT CONTACT SURFACE FINISH

Surface finish equivalent to 150 grit or better as obtained with silicon carbide properly applied on stainless steel sheets is considered in compliance with the requirements of Section D.1 herein.

G.

SPECIAL CONSIDERATION

G.1

In tube chest, vapor heaters and surface condensers of the tubular type in which vapors of the product and/or condensate of these vapors enter the space between the exterior of the tubes and the interior of the shell, means should be provided for mechanically cleaning the exterior surfaces of the tubes and the interior surface of the shell.

G.1.1

Vapor duct surfaces designed to be mechanically cleaned should be accessible for inspection.

G.2

When a high-temperature short-time pasteurization system is included as an integral part of an evaporator system, it should conform to the provisions of the "3-A Accepted Practices for High-Temperature, Short-Time Pasteurizers, Revised, Number 603.03."

These standards shall become effective August 24, 1985, at which time the "3-A Sanitary Standards for Milk and Milk Products Evaporators and Vacuum Pans" Number 16-04 is rescinded and becomes null and void.

[3]*Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.*

3-A Sanitary Standards for Farm Milk Cooling and Holding Tanks

Number 13-08

Formulated by
International Association of Milk, Food and Environmental Sanitarians
United States Public Health Service
The Dairy Industry Committee

It is the purpose of the IAMFES, USPHS, and DIC in connection with the development of the 3-A Sanitary Standards program to allow and encourage full freedom for inventive genius or new developments. Specifications for Farm Milk Cooling and Holding Tanks heretofore or hereafter developed which so differ in design, material, fabrication, or otherwise as not to conform with the following standards, but which in the fabricator's opinion are equivalent or better, may be submitted for the joint consideration of the IAMFES, USPHS, and DIC at any time.

A.

SCOPE

A.1

These standards cover the sanitary aspects of tanks in which bulk milk is cooled and stored on dairy farms. They do not pertain to storage tanks nor to silo-type tanks for milk and milk products used in dairy processing plants nor do they pertain to farm milk storage tanks.

A.2

Tanks made in conformance to these standards will provide the means for cooling the milk.

A.3

In order to conform with these 3-A Sanitary Standards, farm milk cooling and holding tanks shall comply with the following design, material, fabrication and cooling criteria.

B.

DEFINITIONS

B.1

Product: Shall mean milk.

B.2

Farm Milk Cooling and Holding Tank: Shall mean a cylindrical, rectangular, oval or other equally satisfactorily shaped tank.

B.3

Surfaces

B.3.1

Product Contact Surfaces: Shall mean all surfaces which are exposed to the product and surfaces from which liquids may drain, drop or be drawn into the product.

B.3.2

Non-Product Contact Surfaces: Shall mean all other exposed surfaces.

B.4

Lining: Shall mean all surfaces used to contain the product, including the ends, sides, bottom and top.

B.5

Shell: Shall mean the material covering the exterior of the insulation.

B.6

Breast: Shall mean that portion of the metal used to join the lining to the shell.

B.7

Bridge: Shall mean a cover on an open top type tank which is open on both sides and is permanently attached to the lining on opposite sides of the tank. It may be used to support a removable or nonremovable main cover(s) and accessories.

B.8

Outlet: Shall mean the opening in the lining and the passage for milk to the exterior of the tank. The outlet passage starts at the opening in the lining and terminates at the connection for the outlet valve.

B.9

Mechanical Cleaning or Mechanically Cleaning: Shall denote cleaning, solely by circulation and/or flowing chemical detergent solutions and water rinses onto and over the surfaces to be cleaned, by mechanical means.

C.

MATERIALS

C.1

All product contact surfaces shall be of stainless steel of the AISI 300 series[1] or corresponding ACI[2] types (see Appendix, Section F.), or metal which under conditions of intended use is at least as corrosion resistant as stainless steel of the foregoing types and is nontoxic and non-absorbent, except that:

C.1.1

Rubber and rubber-like materials may be used for slingers, drip shields, agitator seals, agitator bearings,

---

[1]*The data for this series are contained in the following reference: AISI Steel Products Manual, Stainless & Heat Resisting Steels, December 1974, Table 2-1, pp. 18-19. Available from: American Iron and Steel Institute, 1000-16th Street, N.W., Washington, D.C. 20036.*

[2]*Alloy Casting Institute Division, Steel Founders Society of America, Cast Metals Fabrication Bldg., 455 State Street, Des Plaines, IL. 60016.*

protective caps for sanitary tubes or fittings or vents, O-Rings, seals, gaskets and parts used in similar applications. These materials shall comply with the applicable provisions of the "3-A Sanitary Standards for Multiple-Use Rubber and Rubber-Like Materials Used as Product Contact Surfaces in Dairy Equipment, Number 18-00."

C.1.2

Plastic materials may be used for slingers, drip shields, agitator seals, agitator bearings, protective caps for sanitary tubes or fittings or vents. O-Rings, seals, gaskets, direct reading gauge tubes, moisture traps on vacuum lines, in sight and/or light openings and parts used in similar applications. These materials shall comply with the applicable provisions of the "3-A Sanitary Standards for Multiple-Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment, Number 20-00," as amended.

C.1.3

Except for the protective caps provided for in C.1.1 and C.1.2, sanitary fittings shall be made of materials provided for in the "3-A Sanitary Standards for Fittings Used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products, Revised, Number 08-09," as amended and supplements thereto.

C.1.4

Glass of a clear heat resistant type may be used for direct reading gauge tubes and in sight and/or light openings.

C.1.5

Where materials having certain inherent functional properties are required for specific applications, such as bearing surfaces and rotary seals, carbon, and/or ceramic materials may be used. Ceramic materials shall be inert, non-porous, non-toxic, non-absorbent, insoluble, resistant to scratching, scoring, and distortion when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment.

C.2

The materials used for the lining shall not be less than 18 U.S. standard gauge.

C.3

All non-product contact surfaces shall be of corrosion-resistant material or material that is rendered corrosion resistant. If coated, the coating used shall adhere. All non-product contact surfaces shall be relatively non-absorbent, durable and cleanable. Parts removable for cleaning having both product contact and non-product contact surfaces shall not be painted.

D.

FABRICATION

D.1

All product contact surfaces shall be at least as smooth as a No. 4 finish on stainless steel sheets. (See Appendix, Section G.) The measuring rod of an immersion-type measuring device may have a dull finish to facilitate reading.

D.2

All permanent joints in product surfaces shall be welded except that rolled on sanitary pipeline ferrules or flanges may be used on connections beyond the shell. All welded areas of product contact surfaces shall be at least as smooth as the adjoining surfaces.

D.3

All product contact surfaces shall be easily accessible for cleaning, either when in an assembled position or when removed. Removable parts shall be readily demountable. Tanks that are to be mechanically cleaned shall be designed so that all product contact surfaces of the tank, including the product contact surfaces of the opening for a vertical mechanical agitator, and all non-removable appurtances thereto can be mechanically cleaned.

D.4

Product contact surfaces shall be self-draining except for normal clingage. The lining shall be so constructed that it will not sag, buckle, or become distorted in normal use. Horizontal tanks shall be so constructed that they will not prevent complete drainage of water when the tank has a pitch of not more than 1 inch in 100 inches. If the tank is designed for use on a vacuum system, the construction shall be such that the lining will not be distorted when the internal pressure is 20 inches of mercury below atmospheric pressure.

D.4.1

When the tank is level or when it is in the position in which it was calibrated or when it is in position to be calibrated, the bottom shall pitch to the outlet to effect complete drainage.

D.4.2

If the tank is designed for mechanical cleaning, and has a flat bottom, the bottom shall pitch (1) at least ¼ inch per foot toward the outlet or (2) at least ¾ inch per foot toward the outlet in a vertical tank.

D.5

Gaskets shall be removable. Any gasket groove or gasket retaining groove shall not exceed ¼ inch in depth or be less than ¼ inch wide except those for standard O-Rings smaller than ¼ inch.

D.6

All internal angles of 135° or less on product contact surfaces shall have minimum radii of ½ inch, except that:

D.6.1

The minimum radii for accessories, appurtenances, or bridges that are welded to product contact surfaces shall be not less than ¼ inch.

D.6.2

The minimum radii in agitator shaft bottom guide bearings and in gasket grooves or gasket retaining grooves other than those for standard ¼ inch and smaller O-Rings shall be not less than ⅛ inch.

D.6.3

The minimum radii in grooves for standard ¼ inch

O-Rings shall be not less than 3/32 inch and for standard 1/8 inch O-Rings shall be not less than 1/32 inch.

D.6.4

The minimum radii of covers and agitator assemblies shall not be less than 1/4 inch.

D.7

There shall be no threads on product contact surfaces.

D.8

All sanitary fittings and connections shall conform with the applicable provisions of the "3-A Sanitary Standards for Fittings Used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products, Number 08-09," as amended and supplements thereto except that materials conforming to C.1.1 or C.1.2 may be used for caps of sanitary design for the protection of terminal ends of sanitary tubes, fittings or vents.

D.9

The breast shall be integral with or welded to the lining and shall be sloped so that drainage is away from the lining. The junction of the breast and the shell shall be welded or effectively sealed.

D.10

Covers

D.10.1

Main Covers for Open Top Type Tanks.

Main covers (1) shall be sufficiently rigid to prevent buckling, (2) shall be self-draining, (3) shall be provided with an adequate, conveniently located and durable handle(s) of sanitary design, which is welded in place or formed into the cover materials, (4) unless gasketed, shall have downward flanges not less than 3/8 inch along all edges and (5) shall be close fitting. If the cover is not gasketed, the clearance between the surface of the cover and the surface of the tank it is designed to contact shall not exceed 3/32 inch. Covers not exceeding 24 × 30 inches or 30 inches in diameter may be removable and shall be designed to be self-draining in the closed position.

D.10.2

Non-removable Covers for Open Top Type Tanks.

Non-removable covers (1) shall be of a type that can be opened and maintained in an open position, (2) shall be designed to be selfdraining when in the closed position, (3) shall be designed so that when the covers are in any open position liquid from the exterior surface will not drain onto the lining and (4) shall be designed so that when in their fully opened position, drops of condensation on the underside will not drain into the tank. Covers of openings that will be held in place by gravity or vacuum may be of the lift off type and may be provided with a clamp(s) or other device to maintain them in position.

D.10.3

Bridges and Fixed Covers for Open Top Type Tanks.

Bridges and fixed covers shall pitch to the outside edge(s) of the tank for complete drainage, and shall have a raised flange not less than 3/8 inch in height where the edge(s) meets the main cover(s). Bridges and fixed covers shall be integral or welded to the lining and shall be installed so the underside is accessible for cleaning and inspection without completely entering the tank. Bridges shall not exceed 24 inches in width. Generally horizontal fixed covers, located at ends or sides of an open top type tank (or segments of cylindrical open top type tanks) with generally vertical side walls, shall not exceed more than 12 inches over the surface of the product.

D.10.4

Manhole Covers for Closed Type Tanks.

Covers for manholes in side walls and/or ends shall be either of the inside or outside swing type. If the cover swings inside, it shall also swing outside, away from the opening. Threads or ball joints employed to attach the manhole cover(s) and its appendages shall not be located within the lining. Covers for manholes in the top of tanks shall be of the outside swing type or be of a removable type.

D.10.5

All openings in the lining or in fixed covers or in bridges, or main covers of open top type tanks, except those for agitators, openings with permanently attached sanitary pipeline fittings, and thermometers or immersion type measuring devices that remain in place while the product is in the tank, shall be provided with removable covers, which are designed to make close contact with the upper edges of the opening or cover surface, and when in the main cover the removable cover(s) shall remain in position when the main cover is in an open position.

D.10.6

An umbrella or drip shield of sanitary design that can be raised or dismantled, to permit cleaning of all of its surfaces, shall be provided to protect against the entrance of dust, oil, insects and other contaminants into the tank through the space around the agitator shaft.

D.10.7

The water compartment of a tank designed for refrigerated water cooling shall have a cover. The clearance between surface of the cover and surface of the water compartment it is designed to contact shall not exceed 1/16 inch.

D.11

Openings

The edges of all openings into the lining that are upward or horizontal shall extend upward or outward at least 3/8 inch above or beyond the shell or the exterior surface or be fitted with a permanently installed sanitary pipeline fitting.

D.11.1

The main openings of tanks shall be of sufficient number, adequate in size, and so located that all product contact surfaces are easily accessible and, except for the product contact surfaces of parts removable for cleaning, can be inspected visually without entering

the tank.

D.11.2

An exception to the requirements of D.11.1 is made for closed type tanks, having product contact surfaces that cannot be manually cleaned and inspected without entering the tank.

D.11.2.1

The minimum inside height of this type of tank shall be 36 inches; and if the inside height exceeds 96 inches, means shall be provided (see Appendix, Section H.) that will facilitate manual cleaning and inspection of all product contact surfaces or means shall be provided for mechanically cleaning the product contact surfaces of the tank and all non-removable appurtenances thereto. This type of tank shall have a manhole opening(s) complying with the provisions of D.11.5.

D.11.3

An inlet sanitary pipeline connection shall be at least 1½ inches or the inlet opening shall accommodate at least 1½ inch 3-A sanitary tubing.

D.11.4

Agitator openings: Agitator shaft openings through the bridge or top enclosure shall have a minimum diameter of 1 inch on tanks which require removal of the agitator shaft for cleaning or be of a diameter that will provide a 1 inch minimum annular cleaning space between the agitator shaft and the inside surface of the flanged opening on tanks which do not require removal of the agitator for cleaning.

D.11.5

Manhole openings: A manhole opening, if provided, shall be located at the outlet end or side of the tank or the top of the tank. The inside dimensions of the manhole opening shall not be less than 15 × 20 inches oval, 12 × 27 inches elliptical, or 18 inches diameter.

D.11.6

Sight and Light Openings: Sight and light openings shall be provided when no other opening is available for viewing the surface of the milk and shall be of such design and construction that the inner surfaces drain inwardly; and if the tank is designed for mechanical cleaning, the inner surface of the glass (or plastic) shall be relatively flush with the inner surface of the lining. The inside diameter of the opening, if only one is provided, shall be at least 5¾ inches. If two openings are provided, the inside diameter of each shall be at least 3¾ inches. The external flare of the opening shall be pitched so that liquid cannot accumulate.

D.11.7

Thermometer connections: A connection(s) or opening(s) which will accommodate a temperature sensing elements(s) of a thermometer(s) shall be provided. The connection(s) and/or opening(s) shall be located in the top enclosure, cover, bridge or through an end or sidewall. Thermometer wells may be used. The bulb of the temperature sensing element shall be located so as to permit registering the product temperature when the tank contains no more product than 20 percent of its capacity and shall be located so that the sensing element is not influenced by the cooling medium. Connections and/or openings shall conform to one of the following:

D.11.7.1

The applicable fittings found in the "3-A Sanitary Standards for Instrument Fittings and Connections Used on Milk and Milk Products Equipment, Number 09-07."

D.11.7.2

Fittings for temperature sensing devices which do not pierce the tank lining, but which have temperature sensing element receptacles securely attached to the exterior of the lining.

D.11.8

The vacuum connection for a tank designed to be operated under vacuum shall be standard stainless steel tubing not less than 1½ inch in diameter and not longer than 4 inches (See Appendix, Section I.).

D.12

Outlet: The outlet shall provide complete drainage of the tank. The outside diameter of the outlet passage shall conform to that of 3-A sanitary tubing and shall not be less than that of 2-inch tubing. The wall thickness of the outlet passage shall be no greater than ⅛ inch. The terminal end of the outlet passage shall have a rolled-on or a welded sanitary pipeline ferrule or flange. The ferrule or flange shall not be below the bottom of the shell. The distance between the nearest point on the shell to the face of the ferrule or flange on the terminal end of a horizontal type outlet shall not be more than the smaller of (1) twice the nominal diameter of the outlet passage or (2) five inches. The outlet shall be one of the following types:

D.12.1

Horizontal type. The bottom of the outlet passage shall be at least as low as the low point of the lining at the outlet. The outlet passage shall be pitched downward toward the terminal end.

D.12.2

Vertical type. The vertical centerline of the outlet passage shall be as close as practical to a side wall of the tank. The outlet passage shall be a generally horizontal extension of an elbow which is a part of or is welded to the lining. The outlet passage shall not pass through the bottom of the shell if product will be held in the passage.

D.13

Outlet valves: Valves, when provided, shall conform to D.8 or if the valve is within the lining or in the outlet passage, and the seat is an integral part of the lining or the outlet passage, a compression-type valve conforming to the applicable provisions of D.13.1 may be used. A cap conforming to D.8 shall be provided for the outlet end of the valves furnished with tanks.

D.13.1

Compression-type valve in the tank or outlet passage. This type of valve shall have a metal to metal or rub-

ber or rubber-like material to metal seat. The rubber or rubber-like material may be either removable or bonded. The handle or valve operating rod shall extend through the bridge or the handle shall be outside the shell. If the handle or valve operating lever extends through the bridge, it shall have a permanently attached shield to protect against the entrance of contaminants into the tank through the space around the handle or valve operating lever.

D.14

Agitators: Means for mechanical and/or air agitation shall be provided that will result in a variation in milk fat content of the product in the tank of not more than plus or minus 0.1 percent as determined by an Official AOAC Milk Fat Test[3], when the tank is filled to (1) 100 percent of its capacity with product and the agitator has been in operation for five minutes if the capacity of the tank is less than 1500 gallons or (2) 100 percent of its capacity with product and the agitator has been in operation for ten minutes if the capacity of the tank is 1500 gallons or larger. Agitators, if not designed for mechanical cleaning, shall be readily accessible for manual cleaning and inspection either in an assembled position or when removed. A seal for the agitator shaft, if provided, shall be of a packless type, sanitary in design and durable with all parts readily accessible for cleaning. A sanitary seal for the agitator shaft shall be provided for (1) a horizontal agitator, (2) a vertical agitator when it is specified that the tank is to be located so that the portion of the shaft outside the tank is not in the milk house or milk room, and (3) a tank designed to be operated under vacuum. The means for agitation shall be one of the following:

D.14.1

Mechanical, top entering, non-removable type.

There shall be at least a 1-inch space between the non-removable agitator and the bottom of the lining, unless the agitator is mountd on a hinged-type cover. A bottom shaft bearing shall not be provided for a non-removable type agitator.

D.14.2

Mechanical, top entering, removable type.

This type of agitator shall be provided with an easily accessible, readily demountable coupling of either a sanitary type located within the lining or a coupling located outside of the lining provided that it is above the shield provided to protect the annular space around the shaft. All product contact surfaces of the agitator shall be visible when the agitator is removed. A bottom support or guide, if used, shall be welded to the lining, shall not interfere with drainage of the tank and the inside angles shall have a minimum radii of ⅛ inch. When the agitator shaft has a bearing cavity, the diameter of the cavity shall be greater than the depth. The agitator shall be easily demountable for cleaning of the bearing and any shaft cavity.

D.14.3

Mechanical side entering type.

This type of agitator and shaft and its complete seal shall be readily demountable for manual cleaning. Non-removable parts having product contact surfaces shall be designed so that the product contact surfaces are readily cleanable from the inside of the tank.

D.14.4

Air agitation.

The means for air agitation shall comply with the applicable provisions of D.15.

D.15

Air for Agitation or Movement of Product: Means for applying air under pressure shall conform to the applicable provisions of the "3-A Accepted Practices for Supplying Air Under Pressure in Contact with Milk, Milk Products and Product Contact Surfaces, Number 604-03," and the following:

D.15.1

Clamp type fittings shall not be used within the lining.

D.15.2

Tubing and related fittings within the lining shall be readily and easily removable for cleaning outside the tank or be designed for mechanically cleaning. If designed for mechanically cleaning, the tubing and all related fittings shall be self-draining.

D.15.3

Permanently mounted air tubing shall be constructed and installed so that it will not sag, buckle, vibrate or prevent complete drainage of the tank or tubing and shall be located so that the distance from the outside of the tubing to the lining shall be at least two inches, except at point of entrance.

D.16

Mechanical Agitator Driving Mechanism Mounting: The driving mechanism when above the lining shall be securely mounted in a position that will provide a minimum distance of 4 inches measured vertically downward from the bottom of the driving mechanism housing, excluding bearing bosses and mounting bosses, to the nearest surface of the tank; and in such a manner that all surfaces of the tank under or adjacent to the driving mechanism shall be readily accessible for cleaning and inspection.

D.17

Thermometers: Each tank shall be provided with an indicating thermometer and/or a recording thermometer complying with the applicable specifications for indicating and recording thermometers in Appendix, Section J. The thermometer or the temperature sensing element of the thermometer shall fit one of the connections or openings provided for in D.11.7.1 and D.11.7.2.

---

[3]*The method of making these tests will be found in the following reference: Official Methods of Analysis: Available from the Association of Official Analytical Chemists, P.O. Box 540, Benjamin Franklin Station, Washington, D.C. 20004.*

D.18

Vents: A vent(s), if provided, shall be so designed to protect against the entrance of contaminants into the tank and the vent(s) shall have sufficient free opening area to prevent back pressure during filling and to prevent vacuum during emptying of the tank. It shall be in the front head near the top of the tank or in the top of the tank or in a manhole cover for a manhole in the top of the tank. The vent(s) shall terminate in the milk house or milk room. It shall be provided with a perforated cover having openings not greater than 1/16 inch diameter, or slots not more than 1/32 inch wide. Woven wire mesh shall not be used for this purpose. It shall be so designed that parts are readily removable and readily accessible for cleaning.

D.19

Cleaning: Tanks having an inside height of more than 96 inches shall be provided with means (see Appendix, Section H.) that will facilitate manual cleaning and inspection of all product contact surfaces or means shall be provided for mechanically cleaning the product contact surfaces of the tank and all non-removable appurtenances thereto.

D.20

Sample Cock: A sample cock shall be provided when a sample cannot be readily obtained from a top opening or a sample port opening in the tank. It shall be of a type that has its sealing surface relatively flush with the product contact surface of the tank and have an inside diameter no less than that of one inch 3-A sanitary tubing.

D.21

Tank Supports: The means of supporting a tank designed to be installed wholly within the milk house or milk room or the means of supporting the portion of a tank that will be in the milk house or milk room shall be one of the following:

D.21.1

With legs: Adjustable legs shall be of sufficient number and strength and so spaced that the filled tank will be adequately supported. Legs shall be smooth with rounded ends and have no exposed threads. Legs made of hollow stock shall be sealed. Legs shall be of a length that will provide (1) the distance between lowest interior surface of the outlet connection and the floor will be not less than 4 inches and (2) a clearance of at least 6 inches between the floor and the bottom of a tank 72 inches or less in diameter or width, except in the case of a V-bottom or a rounded bottom tank of which the outer shell slopes continually upward from the outlet centerline, in which case the minimum clearance may be 4 inches if it increases to 6 inches within a horizontal distance of not more than 12 inches on each side of this centerline. On a tank more than 72 inches in diameter or width, the clearance shall be at least 8 inches. (Where Weights and Measures Codes require that a seal be placed on the legs to detect height adjustment after the tank has been leveled or calibrated, the holes for seals shall be designed and located, or sealed, to prevent entrance of moisture into the legs.)

D.21.2

Mounted on a Slab or Island: The base of the tank shall be such that it may be sealed to the mounting surface (see Appendix, Section K.)

D.22

Prevention of a Significant Product Temperature Increase:

D.22.1

The tank shall be capable of preventing, in 12 hours, a product temperature increase greater than 5°F in a tank filled to 100 percent of its capacity with product when there is a difference of 50°F between the ambient temperature and the average temperature of the product in the tank. For test purposes, water may be substituted for product.

D.22.2

Insulation material, if provided, shall be of a nature and installed in a manner that will prevent shifting or settling.

D.23

A measuring device of the immersion type or of the direct reading gauge type, if provided, shall comply with D.23.1 or D.23.2.

D.23.1

Immersion Type: An immersion measuring device shall comply with the applicable provisions of the code entitled "Farm Milk Tanks" in the National Bureau of Standards Handbook 44-Fourth Edition 1971. The measuring rod shall have graduation marks not less than .005 inch in width and not exceeding .008 inch in depth. The measuring rod consists of a graduated portion, a seat to engage the measuring rod supporting bracket or other supporting means and a handle. It does not include the supporting bracket or other supporting means. The measuring rod may be two or more parts welded together or may be one piece. The handle shall extend above the bridge or main cover, or shall be located outside of the outer shell. The tank serial number stamped or etched on the rod shall be located as high on the rod as in practicable. The opening through which the measuring rod extends shall be protected against liquids or other contaminants entering the tank from that portion of the measuring rod outside the tank.

D.23.2

Direct Reading Gauge: A direct reading gauge of the glass or plastic tube type shall be sanitary in design and construction and shall be readily accessible for cleaning or shall be designed for mechanical cleaning. The gauge shall comply with the applicable provisions of the code entitled "Farm Milk Tanks" in the National Bureau of Standards Handbook 44-Fourth Edition, as amended by the 1977 Replacement Sheet for section S.3.5, "External Gauge Assemblies." If designed for mechanical cleaning, the inside diameter of

the gauge parts shall be sufficiently uniform that all product contact surfaces will be cleaned. It shall be designed and constructed so that all product in the gauge will be discarded. Means to accomplish this shall be provided at the lowest point and in such a manner that product in the gauge will not enter the tank outlet line nor re-enter the tank. The valve shall be close coupled. The distance, measured along the passage for the product in the tank to the gauge valve, from the nearest point on the shell to the ferrule or flange for the valve shall not be more than the smaller of (1) twice the nominal diameter of the passage or (2) five inches.

D.24

Non-Product Contact Surfaces: Non-product contact surfaces shall comply with the following:

D.24.1

They shall be smooth, free of pockets and crevices and be readily cleanable.

D.24.2

Surfaces to be coated shall be effectively prepared for coating.

D.24.3

The shell shall be effectively sealed against moisture and vermin at all joints and at junctions with the breast, manhole openings, outlets and other openings.

D.24.4

A vent or weep hole may be provided in the shell. If provided, it shall be located in a position that will provide drainage from the shell and shall be vermin proof.

D.24.5

Outside welds need not be ground.

E.

COOLING

E.1

Cooling Requirements.

A tank when operated with a condensing unit of the minimum capacity given on the name plate shall have enough refrigerated surface to accomplish the following when the condensing unit is in operation during the filling period:

E.1.1

First Milking.

Tanks designed for the following pick up frequency to cool the milk in the tank from 90°F to 50°F within the first hour after being filled to the corresponding volume and from 50°F to 40°F within the next hour:

E.1.1.1

Everyday pick up filled to 50 percent of its rated capacity.

E.1.1.2

Every other day pick up filled to 25 percent of its rated capacity.

E.1.2

Second or Subsequent Milkings.

Prevent the blend temperature to rise above 50°F during the addition of milk.

E.2

Cooling Information.

The tank shall have an information or data plate permanently attached to it giving the following information or the information shall appear on the name plate (see E.2.2.1):

E.2.1

The maximum rate at which milk can enter the tank and comply with the cooling requirements of E.1.1 and E.1.2.

E.2.2

The minimum condensing unit capacity required when the milk enters the tank at the maximum rate.

E.2.2.1

Maximum rate at which milk can enter this tank and meet the cooling requirements of the 3-A Sanitary Standards for Farm Milk Cooling and Holding Tanks, Number 13-06, is _____U.S. Gallons per hour. When milk enters the tank at the maximum rate, the minimum condensing unit capacity is *_____ BTU/hr. at *_____°F saturated suction temperature.

**The BTU capacity specified is to be at the saturated suction temperature designated by the manufacturer.*

E.3

Cooling System.

E.3.1

In determining cooling capacity, the ambient temperature shall be 90°F and when water cooled condensers are used, the refrigerant condensing temperature shall be not less than 103°F.

E.3.2

The tank shall be provided with an automatic refrigeration control capable of functioning on a change in product temperature of not more than plus or minus 2°F at 37°F.

APPENDIX

F.

STAINLESS STEEL MATERIALS

Stainless steel conforming to the applicable composition ranges established by AISI[1] for wrought products, or by ACI[2] for cast products, should be considered in compliance with the requirements of Section C.1 herein. Where welding is involved, the carbon content of the stainless steel should not exceed 0.08 percent. The first reference cited in C.1 sets forth the chemical ranges and limits of acceptable stainless steels of the 300 series. Cast grades of stainless steel corresponding to types 303, 304, and 316, are designated CF-16F,

CF-8 and CF-8M, respectively. These cast grades are covered by ASTM[4] specifications A296-68 and A351-70.

G.

PRODUCT CONTACT SURFACE FINISH

Surface finish equivalent to 150 grit or better as obtained with silicon carbide, is considered in compliance with the requirements of Section D.1 herein.

H.

MANUAL CLEANING

If the inside height of a tank exceeds 96 inches, one means for manual cleaning is to weld a sanitary stainless steel rung on each end of the tank to support a removable platform at a height which will facilitate cleaning and inspection.

I.

VACUUM PIPING

When vacuum piping is provided, the piping downstream from the elbow connected to the vacuum connection on the tank (see D.11.8) should pitch downward from the tank to a moisture trap. The piping between the tank vacuum connection and the moisture trap should be stainless steel and have a pitch of not less than 1 inch in the first 12 inches.

J.

THERMOMETERS

J.1

Indicating Thermometers.

Scale Range.–Shall have a span not less than 50°F including normal storage temperatures plus or minus 5.0°F with extension of scale on either side permitted; graduated in not more than 2.0°F divisions.

Temperature Scale Divisions.–Spaced not less than one-sixteenth of an inch apart between 35°F and 55°F.

Accuracy.–Within 2°F plus or minus, throughout the specified scale range.

Stem Fitting.–Shall conform to the "3-A Sanitary Standards for Instrument Fittings and Connections Used on Milk and Milk Products Equipment, Number 09-07" or shall be a stem fitting that does not pierce the lining or means shall be provided to permit securely fastening the temperature sensing element to the outer surface of the lining.

J.2

Recording Thermometers.

Case.–Moisture proof under operating conditions in a milk house or milk room.

Scale.–Should have a scale span of not less than 50°F, including normal storage temperature plus or minus 5°F, graduated in not more than 2°F divisions with not more than 40°F per inch of scale; graduated in time scale divisions of not more than 1 hour having a chord or straight line length of not less than one-eighth of an inch at 40°F. Chart must be capable of recording temperatures up to 120°F. (Span specifications do not apply to extentions beyond 100°F.).

Temperature Accuracy.–Within 2°F plus or minus, between specified range limits.

Pen-Arm Setting Device.–Easily accessible; simple to adjust.

Pen and Chart Paper.–Designed to give line not over one-fortieth of an inch thick when in proper adjustment; easy to maintain.

Temperature Sensor.–Protected against damage at 212°F.

Stem Fitting.–Should conform to the "3-A Sanitary Standards for Instrument Fittings and Connections Used on Milk and Milk Products Equipment, Number 09-07," or should be a stem fitting that does not pierce the lining or means shall be provided to permit securely fastening the temperature sensing element to the outer surface of the lining.

Chart Speed.–The circular chart should make one revolution in not more than seven days and should be graduated for a maximum record of seven days. Strip chart should move not less than 1 inch per hour and may be used continuously for 1 calendar month.

K.

SLABS OR ISLANDS

When a tank is designed to be installed on a slab or an island, the dimensions of the slab or island should be such that the tank will extend beyond the slab or island at least one inch in all horizontal directions. The slab or island should be of sufficient height so that the bottom of the outlet connection is not less than 4 inches above the floor. The surface of the slab or island should be coated with a thick layer of waterproof mastic material, which will harden without cracking. The junction of the outer shell of the tank and the slab or island should be sealed.

L.

DETERMINATION OF COOLING CAPABILITY

In determining the capability of a farm cooling tank to meet the cooling requirements specified in E.1.1 and E.1.2 at the maximum rate at which milk can enter the tank given on the information plate:

L.1

90°F water may be substituted for milk, and

L.2

before the addition of the second and subsequent milkings, the water or milk in the tank should be cooled to 37°F and the condensing unit should be allowed to operate and automatically shut off.

M.

SUPPLEMENTAL DATA PLATE INFORMATION

M.1

The data plate of the tank should also include the time the agitator was designed to be in operation (5 or 10 minutes) to obtain the homogeneity required in D.14.

[4]*Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.*

M.2

Example of a data plate legend:

The agitator of this tank is designed so that it must be in continuous operation *_____minutes before removing a product sample.

**i.e. whether 5 or 10.*

This amendment shall become effective August 24, 1985, at which time the "3-A Sanitary Standards for Farm Milk Cooling and Holding Tanks, Serial #13-07," is rescinded and becomes null and void.

Rescinding Amendment to 3-A Sanitary Standards for Fittings Used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products, Part I and Part II Number 08-17 Rev.

Number 08-18
Formulated by
International Association of Milk, Food and Environmental Sanitarians
United States Public Health Service
The Dairy Industry Committee

In accordance with the action of the 3-A Sanitary Standards Committees as recorded in the minutes of the May 1984 meeting, Section E.5, lever-operated compression type valves, Part I and 3-A drawings, numbers 3-A-100-31 and 3-A-100-32, Part II of the 3-A Sanitary Standards for Fittings Used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products, dated September 10, 1983, Number 08-17 Rev. is hereby rescinded. Subsequent to the effective date, Section E.5, lever-operated compression types valves, Part I and 3-A drawings, numbers 3-A-100-31 and 3-A-100-32, Part II of the 3-A Sanitary Standards for Fittings Used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products, dated September 10, 1983, Number 08-17 Rev. will become null and void. This amendment will become effective August 31, 1985.

READER SERVICE INFORMATION

To receive information on membership in the International Association (IAMFES) Circle 360 on this page.

International Association of Milk, Food and Environmental Sanitarians, Inc.

Use this Reader Service Page to receive information on products and services in this issue. . .

Please complete all information.
Circle numbers and mail today →
Limit 10 inquiries

Numbers do not apply to the 3-A Standards

101	121	141	161	181	201	221	241	261	281	301	321	341
102	122	142	162	182	202	222	242	262	282	302	322	342
103	123	143	163	183	203	223	243	263	283	303	323	343
104	124	144	164	184	204	224	244	264	284	304	324	344
105	125	145	165	185	205	225	245	265	285	305	325	345
106	126	146	166	186	206	226	246	266	286	306	326	346
107	127	147	167	187	207	227	247	267	287	307	327	347
108	128	148	168	188	208	228	248	268	288	308	328	348
109	129	149	169	189	209	229	249	269	289	309	329	349
110	130	150	170	190	210	230	250	270	290	310	330	350
111	131	151	171	191	211	231	251	271	291	311	331	351
112	132	152	172	192	212	232	252	272	292	312	332	352
113	133	153	173	193	213	233	253	273	293	313	333	353
114	134	154	174	194	214	234	254	274	294	314	334	354
115	135	155	175	195	215	235	255	275	295	315	335	355
116	136	156	176	196	216	236	256	276	296	316	336	356
117	137	157	177	197	217	237	257	277	297	317	337	357
118	138	158	178	198	218	238	258	278	298	318	338	358
119	139	159	179	199	219	239	259	279	299	319	339	359
120	140	160	180	200	220	240	260	280	300	320	340	360

Expires August 1, 1985; Foreign September 1, 1985

Name _____

Company Name _____

Title _____

Address _____

City _____ State/Province _____

Zip _____ Country _____

Occupation _____

Reader requests for information are sent to the appropriate company. Follow-up on reader requests are the responsiblity of the company advertising.

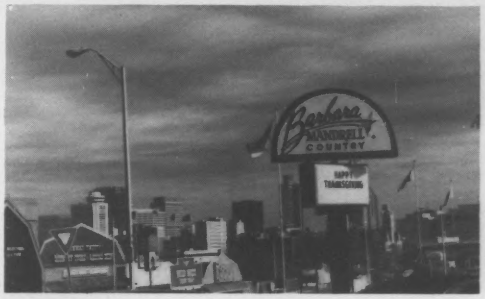
Tear out, fold, staple and mail - self addressed on opposite side

Place
Stamp
Here

IAMFES, Inc.
Reader Service Information
P.O. Box 701
Ames, IA 50010

Y'All Come - Nashville '85

Come on down to the 72nd Annual Meeting of IAMFES, August 4-8, 1985, at the Hyatt Regency in Nashville, Tennessee. In addition to the education program, we've cooked up some "down home" activities, including a pre-convention Grand Ole Opry visit on Saturday evening, August 3. There's lots to do in Nashville.....hope to Tennes"see" you there!



72nd Annual Meeting
Hyatt Regency, August 4-8, 1985
Nashville, Tennessee

MAIL TO: Cecil White, Finance Chairman
TAMWFP
1418 Highland Avenue
Murfreesboro, Tennessee 37130

Make check or money order payable to:
"IAMFES 1985 Meeting Fund"

Please check where applicable:

- ☐ Affiliate Delegate
- ☐ Affiliate Member
- ☐ IAMFES Member
- ☐ Past President
- ☐ Executive Board
- ☐ Speaker
- ☐ 30 Year Member
- ☐ 50 Year Member
- ☐ Non Member
- ☐ Student

ADVANCE REGISTER BEFORE JULY 1, 1985 and SAVE!
(Refundable if cancelled prior to June 30, 1985)

ADVANCE REGISTRATION	Member	Companion(s) Each	Student	Non Member
Registration	☐ $30	☐ $10	☐ Free	☐ $40
Grand Ole Opry** (Aug. 3)	☐ $19	☐ $19	☐ $19	☐ $19
☐ 6:30 PM ☐ 9:30 PM	**includes transportation**			
Early Bird Reception*	☐ Free	☐ Free	☐ Free	☐ Free
Tennessee Hoedown	☐ $20	☐ $20	☐ $20	☐ $20
Banquet and Reception	☐ $20	☐ $20	☐ $20	☐ $20
National Mastitis Council*	☐ Free	☐ Free	☐ Free	☐ Free

*Indicate attendance **Indicate preference for showtime

REGISTRATION AT DOOR	Member	Companion(s) Each	Student	Non Member
	☐ $35	☐ $12	☐ Free	☐ $45
	☐ N/A	☐ N/A	☐ N/A	☐ N/A
	☐ Free	☐ Free	☐ Free	☐ Free
	☐ $22	☐ $22	☐ $22	☐ $22
	☐ $22	☐ $22	☐ $22	☐ $22
	☐ Free	☐ Free	☐ Free	☐ Free

Name _____ Companion _____
Employer _____ Tel. No. _____
Address _____ City _____ Province/State _____ Code/Zip _____
Means of Transportation _____ Arrival Date/Time _____ Departure Date _____

Detach and mail directly to hotel

HYATT REGENCY RESERVATIONS
623 Union Street
Nashville, TN 37219

Reserve Rooms Prior to July 3, 1985 To Assure Space
Phone 615-259-1234 Telex #555 144

International Association of Milk, Food & Environmental Sanitarians, Inc.
Annual Meeting August 4-8, 1985

Name(s) _____
Address _____
City _____ State _____ Code/Zip _____ Tel. No. _____
Arrival Date/Time _____ Departure Date _____
Number Persons _____ Number/Type Rooms _____

Special Request _____

Rate: $55.00 Single, Double
FREE PARKING

Guaranteed by: American Express, Carte Blanche, Diner's Club or One Night's Deposit Plus 10.75% Tax
Card # and Type: _____ Expiration Date: _____
Cardholder Name: _____

Abstracts of papers in the June Journal of Food Protection

To receive the* Journal of Food Protection *in its entirety each month call 515-232-6699, ext. A.

Retail Appearance, Odor and Microbiological Characteristics of Pork Loin Chops Packaged in Different Oxygen-Barrier Films as Affected by Loin Storage Treatment, Julie A. Vrana, J. W. Savell, C. W. Dill, G. C. Smith, J. G. Ehlers and C. Vanderzant, Meats and Muscle Biology Section, Department of Animal Science, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas 77843

J. Food Prot. 48:476-481

Pork loins were fabricated immediately (fresh) or stored in parchment paper for 6 d or stored in vacuum packages for 8 d. Chops were packaged in either a high oxygen-permeable (PVC) film or a high oxygen-barrier film (vacuum) to be displayed 4 d or 2, 6 and 10 d, respectively. High oxygen-barrier (HOB) film was superior to PVC film in maintaining desirable visual properties of chops. Chops had less off-odor in HOB film when they were held no longer than 3 or 4 d in HOB packages compared to extended periods of display. Pork loin chops packaged in high oxygen-barrier film can be displayed up to 6 d if chops are from fresh pork loins. Although visual scores for vacuum-packaged chops were acceptable for 10 d for all storage treatments, chops from the parchment paper and vacuum-packaged storage treatments had off-odors which were limiting factors in achieving long shelf life.

Physical Damage of Yogurt. The Role of Secondary Packaging on Stability of Yogurt, M. L. Richmond, B. R. Harte, J. 1. Gray and C. M. Stine, Department of Food Science and Human Nutrition, Michigan State University, East Lansing, Michigan 48824-1224 and School of Packaging, Michigan State University, East Lansing, Michigan 48824-1224

J. Food Prot. 48:482-486

Vibratory motions are common to packaged products in the shipping and distribution environment. Using an MTS vibration table, low-fat plain yogurt (packaged in various shipping containers) was vibrated and then evaluated for phase separation (whey-off) during storage. Three types of damage were apparent: (a) slight or definite whey-off, (b) cracked or broken coagulum and (c) completely disrupted coagulum. After 10 d of storage, whey-off was quantitated. Slight and definite whey-off corresponded to 0.2 to 0.6% (wt/wt) and 0.6 to 1.8% (wt/wt), respectively. Most damage was observed in the top layers of vibrated stacks (10 high). Stretch overwrapping the shippers proved most effective in reducing syneresis, with less than 1% of the primary containers evaluated showing phase separation.

Effect of Oxygen on Development of Off-Flavors in Ultrahigh-Temperature Milk, K. D. Wadsworth and R. Bassette, Food Science Graduate Program, Leland Call Hall, Kansas State University, Manhattan, Kansas 66506

J. Food Prot. 48:487-493

The role of dissolved oxygen as a contributor to flavor deterioration in sterile milk during storage was investigated. Before processing, a concentrated aqueous solution of Tenox-2 was added to half of a batch of pasteurized-homogenized milk to give a final concentration of 400 ppm BHA on a fat basis in the milk. The other half was untreated. Half of each of those batches was treated to reduce oxygen concentrations by a combination of nitrogen sweep and sonication. The remaining two samples (Tenox-2 added and no-Tenox-2) did not receive the deoxygenation treatment. Oxygen levels in the preprocessed-deoxygenated milk were lower (4.6 ppm) than those in the untreated milk (6.9 ppm). All four lots were UHT-sterilized at 135°C for 5 s in an indirect UHT system constructed at Kansas State University. Sterilized milk was collected aseptically in a glove box in 250-ml amber glass bottles, which were closed with either Teflon-lined caps or sterile cotton plugs. Samples from each treatment were stored at 7° and 32°C for 4 months. Samples in capped bottles maintained relatively low (<4 ppm) dissolved oxygen concentrations, whereas those in cotton-plugged bottles had relatively high (7-7.5 ppm) dissolved oxygen concentrations. Dissolved oxygen affected the rate of stale flavor development. Sterile milk in bottles with cotton plugs, which had relatively high concentrations of dissolved oxygen during storage, developed a stale flavor sooner and with greater intensity than milks with lower levels of oxygen. However, acetaldehyde, propanal, n-pentanal, and n-hexanal, which are most likely products of lipid oxidation, did not appear to be principal contributors to staling in sterile milk during storage in this study. Furthermore, the stale flavor development did not parallel changes in thiobarbituric acid (TBA) values. Although antioxidant (40 ppm BHA on fat basis from Tenox-2) did retard oxidation slightly, it did not control staling. A decrease in the concentration of several volatile materials throughout the storage period probably was caused by dissipation of the volatile material through the cotton plug or by their interaction with other compounds in the milk. Acid degree values increased in sterile milk at 32°C during prolonged storage, but changes in ADVs did not parallel development of the stale flavor.

Inhibition of the Antibacterial Lactoperoxidase Thiocyanate-Hydrogen Peroxide System by Heat-Treated Milk, B. Ekstrand, W. M. A. Mullan and A. Waterhouse, Department of Dairy Technology, West of Scotland Agricultural College, Auchincruive, Ayr, U.K.

J. Food Prot. 48:494-498

The antibacterial system, lactoperoxidase-H_2O_2-SCN^- was affected by the presence of heated milk or skim milk reconstituted from powders having received severe heat treatment. This inhibitory effect was related to the increase in exposed sulfhydryl groups and to the redistribution of protein between micellar and whey phases. Chromatographic analyses of heat-treated milk showed that the inhibitory factor was associated with the casein micelle fraction. The inhibition, however, was overcome by addition of unheated skim milk.

Organochlorine and Organophosphorus Insecticides and Industrial Pollutants in the Milk Supplies of Ontario - 1983, R. Frank, H. E. Braun, G. H. Sirons, J. Rasper and G. G. Ward, Agricultural Laboratory Services Branch, Ontario Ministry of Agriculture and Food, Guelph, Ontario, Canada N1G 2W1 and Dairy Inspection Branch, Ontario Ministry of Agriculture and Food, Toronto, Ontario, Canada M5S 1Z1

J. Food Prot. 48:499-504

During the spring of 1983, fluid milk samples were collected from 359 bulk transporters representing 16 counties, municipalities and districts of Ontario, and were analyzed for organochlorine and organophosphorus insecticides plus selected halogenated industrial pollutants. Dieldrin, p,p'-DDE, heptachlor epoxide, and α-BHC were found in over 90% of samples, but none exceeded the accepted maximum residue limits. Polychlorinated biphenyls (PCB), lindane and pentachlorophenol (PCP) were found in 83, 68 and 57% of samples, respectively, with four samples exceeding the permissable PCB limit and one sample exceeding the permissable PCP limit. Residues of chlordane, endosulfan, p,p'-TDE, and p,p'-DDT were identified in only 1.9 to 4.7% of samples, and were present at levels only slightly above the detection limits. Hexachlorobenzene (HCB) was found at low levels in 40% of samples. Mean residues of organochlorines found were as follows (μg/kg butterfat): ΣDDT - 12; α-BHC - 5.3; lindane - 4.0; heptachlor epoxide - 3.9; dieldrin - 6.2; HCB - 0.67; PCB - 24; and PCP - 29. No residues of six organophosphorus insecticides, endrin, methoxychlor or mirex were detected in any samples. This survey was the sixth in a series beginning in 1967. Half-residue disappearance rates were calculated at 3.5, 5.4, 5.6 and 3.0 years for ΣDDT, dieldrin, PCB and HCB, respectively. A case history is included involving the misapplication of fenthion to a dairy herd which revealed a half-residue elimination from milk in approximately 3 d.

Recovery of *Salmonella* Species from Dried Foods Rehydrated by the Soak Method, Clyde R. Wilson, Wallace H. Andrews, Paul L. Poelma and Dean E. Wagner, Division of Microbiology, Food and Drug Administration, Washington, DC 20204, and Minneapolis Center for Microbiological Investigations, Minneapolis, Minnesota 55401

J. Food Prot. 48:505-508

A comparison was made of the recovery of *Salmonella* species from brewers' yeast, dried active yeast, onion powder and soy flour after preenrichment of samples under rapid (swirling) and slow (soaking) conditions of rehydration. The soak method gave improved recovery only with soy flour. Examination of soy flour by the soak method should be limited to 25-g amounts, however, since 100- and 375-g composites were not completely wetted.

Mexican-style Foodservice Operations: Hazard Analyses, Critical Control Points and Monitoring, Frank L. Bryan and Charles A. Bartleson, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Atlanta, Georgia 30333 and Washington State Department of Social and Health Services, Division of Health, Office of Environment Health Programs, Olympia, Washington

J. Food Prot. 48:509-524

Hazard analyses critical control point evaluations were made in four restaurants specializing in Mexican-style foods. Time-temperature evaluations were made of beans, meat products, and rice during cooking, cooling, reheating, and hot-holding, and other food preparation procedures were observed during 3 d of operation. A few samples were collected and tested for *Clostridium perfringens* and aerobic plate counts (APC). Raw

beans harbored *C. perfringens*, but this organism was not isolated from a few samples of garlic powder, cooked beans, cooked chicken meat, cooked chili pork, cooked ground beef, or cooked chimichanga meat. APCs generally were higher as the depth of the refrigerated product increased, in covered pans with refrigerator air circulation blocked by pans above or below and adjacent, or when the product was left unrefrigerated for several hours. Foods cooked in these establishments, with the occasional exception of ground meat, usually reached temperatures that would have killed vegetative forms of foodborne pathogenic bacteria. Foods were usually maintained at satisfactorily high temperatures during hot-holding, except surfaces and regions just below the surface of uncovered foods were frequently below 140°F (60°C). The foods, particularly beans, when put in a traditional manner in pans with lids in refrigerators cooled slowly. Cooling without lids, in freezers, or in pans on top of pans filled with ice led to more rapid cooling. During reheating, products often failed to reach 165°F (74°C). Critical control points in all operations were cooling and reheating. Monitoring of cooling can be done by observing the size and shape of containers, by measuring the depth of product, and by determining whether lids are used during cooling and whether the containers are stored on top of or next to each other. Monitoring of reheating can be done by measuring temperatures at the completion of cooking or during the post-heating temperature rise while products are in steam tables ready for service.

Growth of Sorbate-Resistant and -Sensitive Strains of *Penicillium roqueforti* in the Presence of Sorbate, Michael B. Liewen and Elmer H. Marth, Department of Food Science and The Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 48:525-529

Growth of two strains of *Penicillium roqueforti* in different media foritified with sorbate was observed. The sorbic acid-sensitive strain grew in YES and mycological broths with sorbic acid concentrations up to 500 ppm, and in YM broth with sorbic acid concentrations up to 1000 ppm. The sorbic acid-resistant strain grew in YES and mycological broths with sorbic acid concentrations up to 6000 ppm, and in YM broth with sorbic acid concentrations up to 9000 ppm. Supplementing mycological broth with various ingredients affected growth of the resistant strain. Addition of 1% casein or 0.3% yeast, potato or malt extract increased the amount of mycelia produced in the absence of sorbate, but had little effect on mycelial growth in the presence of 3000 ppm sorbic acid. Substituting maltose for dextrose increased mycelial growth over that in the control medium in the presence of sorbate but had no effect in the absence of sorbate. Substituting sucrose, lactose or starch for dextrose decreased mycelial growth in the absence of sorbate, but had no statistically significant effect in the presence of sorbate. Sorbate had the smallest effect on mycelial growth in YM broth. The resistant strain caused a loss of sorbate from all media, but the sensitive strain did not. 1,3-Pentadiene was produced only by the resistant strain when growth occurred in the presence of sorbate. Uptake of sorbic acid by mycelia was considerably less for the resistant than the sensitive strain.

Laboratory-Scale System to Process Ultrahigh-Temperature Milk, K. D. Wadsworth and R. Bassette, Food Science Graduate Program, Leland Call Hall, Kansas State University, Manhattan, Kansas 66506

J. Food Prot. 48:530-531

A laboratory-scale, indirect, ultrahigh-temperature (UHT) system was constructed using stainless steel tubing (6.35 mm) as the barrier between the heating agent and the product. Nitrogen gas under 80 psi pressure propelled milk through the tubing of the system. The milk was preheated in a hot water bath, brought to sterilization temperature in an oil bath, and held at this temperature in a holding tube. After leaving the holding tube, the milk was cooled rapidly in an ice-water bath and aseptically collected in 250-ml amber colored glass bottles in a glove box. The system effectively sterilized milk with carefully controlled temperature and time.

A Review of Effects of Carbon Dioxide on Microbial Growth and Food Quality, James A. Daniels, Rajagopalan Krishnamurthi and Syed S. Rizvi, Institute of Food Science, Cornell University, Ithaca, New York, 14853

J. Food Prot. 48:532-537

Carbon dioxide is effective for extending the shelf-life of perishable foods by retarding bacterial growth. The overall effect of carbon dioxide is to increase both the lag phase and the generation time of spoilage microorganisms; however, the specific mechanism for the bacteriostatic effect is not known. Displacement of oxygen and intracellular acidification were possible mechanisms that were proposed, then discounted, by early researchers. Rapid cellular penetration and alteration of cell permeability characteristics have also been reported, but their relation to the overall mechanism is not clear. Several researchers

have proposed that carbon dioxide may first be solubilized into the liquid phase of the treated tissue to form carbonic acid (H_2CO_3), and investigations by the authors tend to confirm this step, as well as to indicate the possible direct use of carbonic acid for retarding bacterial spoilage. Most recently, a metabolic mechanism has been studied by a number of researchers whereby carbon dioxide in the cell has negative effects on various enzymatic and biochemical pathways. The combined effect of these metabolic interferences are thought to constitute a stress on the system, and result in a slowing of the growth rate. The degree to which carbon dioxide is effective generally increases with concentration, but high levels raise the possibility of establishing conditions where pathogenic organisms such as *Clostridium botulinum* may survive. It is thought that such risks can be minimized with proper sanitation and temperature control, and that the commercial development of food packaging systems employing carbon dioxide will increase in the coming years.

Enteric Microorganisms in Rheumatoid Diseases: Causative Agents and Possible Mechanisms, Douglas L. Archer, Division of Microbiology, Food and Drug Administration, Washington, DC 20204

J. Food Prot. 48:538-545

The role of foodborne enteric pathogens in the development of three seronegative spondarthropathies (ankylosing spondylitis, Reiter's disease and reactive arthritis) is discussed. Although the prevalence of the HLA-B27 antigen in blood-related individuals suggests a genetic predisposition to these diseases, exogenous environmental factors are also indicated. A clinical profile is given to clarify certain relationships of the seronegative arthropathies. Evidence of the involvement of enteric pathogens in the onset of these conditions following gastrointestinal illness is considered along with the interactions of general and molecular mechanisms of the disease processes and the immune response.

Calendar

1985

June 3-5, NATIONAL COUNCIL FOR INTERNATIONAL HEALTH 1985 ANNUAL INTERNATIONAL HEALTH CONFERENCE, to be held in Washington, D.C. For more information contact: Dr. Curtiss Swezy, Program Manager, National Council for International Health, 2100 Pennsylvania Avenue, N.W., Suite 740, Washington, D.C. 20037.

June 3-14, IN-STORE BAKERY TRAINING PROGRAM, to be held in Manhattan, KS. For more information contact: Donna Mosburg, Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

June 7-8, IFT BASIC SYMPOSIUM: FOODBORNE MICROORGANISMS AND THEIR TOXINS - DEVELOPING METHODOLOGY, to be held in conjunction with the IFT National Meeting in Atlanta, GA. For more information contact: Dr. Norman Stern, USDA-ARS, Beltsville Agricultural Research Center, Beltsville, MD 20705. 301-344-2438. Or contact: Dr. Merle Pierson, Dept. of Food Science & Technology, VPI & SU, Blacksburg, VA 24061. 703-961-6423.

June 8, WORKSHOP ON NEW FOOD INGREDIENT TECHNOLOGY, to be held at the Hilton Towers Hotel, Atlanta. For more information contact: NFBA, 1010 Massachusetts Ave., N.W., Washington, D.C. 20001. 202-789-2844.

June 17-20, BASIC FOOD PLANT MICROBIOLOGY, to be held in Manhattan, KS. For more information contact: Shirley Grunder, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

June 23-26, CANADIAN INSTITUTE OF FOOD SCIENCE AND TECHNOLOGY 28TH ANNUAL CONFERENCE, to be held at the Royal York Hotel, Toronto, Ontario, Canada. For more information contact: Mr. Bill Munns, Conference Chairman, Canada Packers Inc., 95 St. Clair Avenue W., Toronto, Ontario M4V 1P2, Canada. 416-766-4311.

June 24-26, GULF AND SOUTH ATLANTIC STATES SHELLFISH CONFERENCE, to be held in Mobile, AL, to be held at the Mobile Hilton. For more information contact: Jasper A. Brewer, c/o Alabama Department of Public Health, Bureau of Inspection, State Office Building, Montgomery, AL. 205-261-5003.

July 13-20, RAPID METHODS AND AUTOMATION IN MICROBIOLOGY WORKSHOP, to be held at Kansas State University, Manhattan, KS. For more information contact: Jan Hurley, Conference Coordinator, 800-255-2757 (outside Kansas) or 913-532-5575 (in Kansas or outside the U.S.).

July 14-17, SECOND INTERNATIONAL CONFERENCE ON FOULING AND CLEANING IN FOOD PROCESSING (ICFCFP), to be held in Madison, WI. For more information contact: Daryl Lund, University of Wisconsin-Madison, Department of Food Science, 1605 Linden Drive, Madison, WI 53706. 608-262-3046.

July 15-17, TECHNIQUES IN MEASUREMENT WORKSHOP, to be held in Palo Alto, CA. For more information contact: Tragon Corporation, 365 Convention Way, Redwood City, CA 94063. 415-365-1833.

July 15-26, REFRIGERATION TECHNOLOGY FOR BAKERY MAINTENANCE ENGINEERS, to be held in Manhattan, KS. For more information contact: Mrs. Donna Mosburg, Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. Register by phone: Call Donna 913-537-4750 or 1-800-633-5137.

July 22-26, PRINCIPLES OF BAKERY PRODUCTION, to be held in Manhattan, KS. For more information contact: Mrs. Donna Mosburg, Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

August 3-9, 1985 ANNUAL MEETING OF THE SOCIETY FOR INDUSTRIAL MICROBIOLOGY, to be held at the Westin Hotel, in Copley Place, Boston, MA. For more information contact: Mrs. Ann Kulback - SIM Business Secretary, SIM Headquarters, 1401 Wilson Boulevard, Arlington, VA 22209.

AUG. 4-8, IAMFES ANNUAL MEETING to be held at the Hyatt Regency, Nashville, TN. For more information contact: Kathy R. Hathaway, IAMFES, Inc., P.O. Box 701, Ames, IA 50010. 515-232-6699.

August 5-9, "BIOTECHNOLOGY: MICROBIAL PRINCIPLES AND PROCESSES FOR FUELS, CHEMICALS AND BIOLOGICALS," to be held at the Massachusetts Institute of Technology, Cambridge, MA. For more information contact: Director of Summer Session, MIT, Room E19-356, Cambridge, MA 02139.

August 19-30, IN-STORE BAKERY TRAINING PROGRAM, to be held in Manhattan, KS. For more information contact: Donna Mosburg, Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502 913-537-4750.

August 25-30, 9TH SYMPOSIUM OF WAVFH. The World Association of Veterinary Food Hygienists (WAVFH) will hold their 9th Symposium in Budapest, Hungary. For more information contact: 9th WAVFH Symposium, Organizing Commitee, Mester u. 81, H-1453 Budapest Pf 13, Hungary.

September 9-12, ASEPTIC PROCESSING AND PACKAGING OF FOODS, sponsored by The International Union of Food Science and Technology Food Working Party of the European Federation of Chemical Engineering, to be held in Tylosand, Sweden. For more information contact: Ann-Britt Madsen, Kurssekretariatet, Lund Institute of Technology, P.O. Box 118, S-221 00 Lund, Sweden.

September 16-20, MAINTENANCE MANAGEMENT SEMINAR, to be held in Manhattan, Kansas. For more information contact: Mrs. Donna Mosburg, Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

September 17-19, NEW YORK STATE ASSOCIATION OF MILK AND FOOD SANITARIANS, to be held at the Sheraton Inn, Syracuse, NY. For more information contact: D. K. Bandler, 11 Stocking Hall, Cornell University, Ithaca, NY 14853. 607-256-3027.

September 25-26, SIXTH ANNUAL JOINT EDUCATIONAL CONFERENCE, to be held at Valley Inn, Neenah, WI. For more information contact: Ron Buege, West Allis Health Department, 7120 West National Avenue, West Allis, WI. 414-476-3770.

September 30 - October 2, ADVANCED SANITATION PROGRAM, to be held in Chicago, IL. For more information contact: Shirley Grunder, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

September 30 - October 11, IN-STORE BAKERY TRAINING PROGRAM, to be held in Manhattan, KS. For more information contact: Donna Mosburg, Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

October 1-2, SOUTH DAKOTA STATE DAIRY ASSOCIATION CONVENTION to be held at the Ramada Inn, Sioux Falls, So. Dakota. For more information contact: Shirley W. Seas, Ex Secretary, Dairy Science Dept., So. Dakota State University, Brookings, SD 57007.

October 1-3, STORAGE LIVES OF CHILLED AND FROZEN FISH AND FISH PRODUCTS, to be held at The Conference Centre, University of Aberdeen, Aberdeen, Scotland. For more information contact: IIR Conference Organiser, Torry Research Station, PO Box 31, 135 Abbey Road, Aberdeen AB9 8DG, UK.

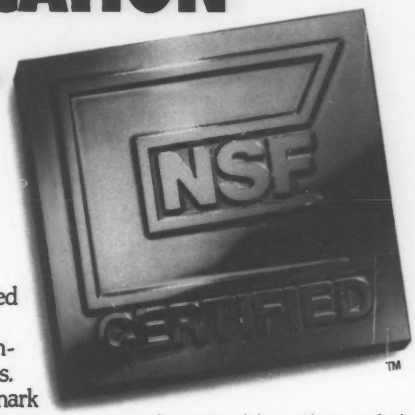
October 2-4, WORKSHOP IN FOOD FLAVOR: DEVELOPMENT, MANUFACTURE AND USE, to be held at the University of Minnesota, St. Paul, MN. For more information contact: Joanne Parsons, Office of Special Programs, 405 Coffey Hall, 1420 Eckles Avenue, University of Minnesota, St. Paul, MN 55108. 612-373-0725.

October 5-9, DFISA FOOD & DAIRY EXPO '85, to be held at the Georgia World Congress Center, Atlanta, GA. For more information contact: Bruce L. D'Agostino, Director, Public Relations, Dairy and Food Industries Supply Assoc., Inc., 6245 Executive Boulevard, Rockville, MD 20852-3938. 301-984-1444, Telex: 908706.

1986

AUG. 3-7, IAMFES ANNUAL MEETING to be held at the Radisson South, Minneapolis, MN. For more information contact: Kathy R. Hathaway, IAMFES, Inc., P.O. Box 701, Ames, IA 50010. 515-232-6699.

COME TO NSF FOR CERTIFICATION SERVICES.



Many products, systems, and services which affect public health and environmental quality are not covered by National Sanitation Foundation standards. However, they *are* addressed by other voluntary consensus standards or governmental regulations. Under the new Certification Services program, these products, systems, or services are tested and evaluated *by* NSF. Those found in compliance with the various criteria earn the right to display the NSF Certified™ mark and appear in a published annual Registry.

FREE!
WRITE FOR:
- Certification Services Brochure
- NSF Facts Brochure

Certification by NSF assures objective testing and analyses. Since 1944, we have been highly respected as a neutral third party for evaluation and testing of commercial products and services. Use of the NSF Certified™ mark is *proof* that your product, system, or service meets the referenced standard or regulation. And the widely circulated Registry provides easy reference by purchasers and regulatory officials. The net result is that when NSF standards do not cover a product type, but other standards or regulations do, *certification is a viable alternative.*

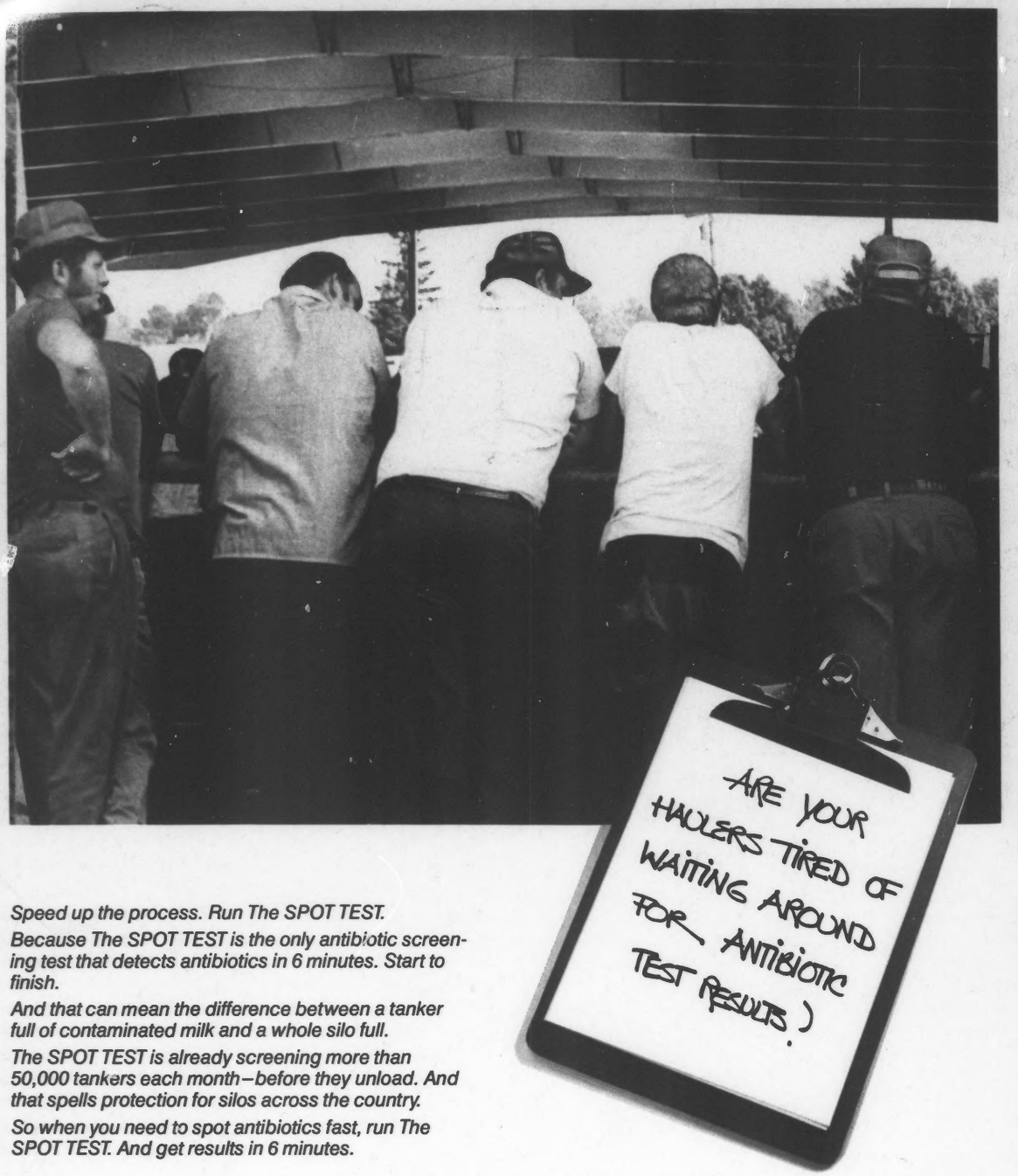
The certification process is a simple procedure requiring: 1) completion of an application; 2) evaluation of the product, system, or service; and 3) unannounced visits to the company's facility by an NSF representative to assure continued compliance.

Please contact Certification Services to obtain an application, learn more about the service, inquire about certified products, or to discuss your needs in more detail. Inquiries from anywhere in the world are welcome.

National Sanitation Foundation, Office and Laboratories, P.O. Box 1468, Ann Arbor, MI 48106 USA. Or call (313) 769-8010; Telex: 753215

NATIONAL SANITATION FOUNDATION

Please circle No. 167 on your Reader Service Page



Speed up the process. Run The SPOT TEST.

Because The SPOT TEST is the only antibiotic screening test that detects antibiotics in 6 minutes. Start to finish.

And that can mean the difference between a tanker full of contaminated milk and a whole silo full.

The SPOT TEST is already screening more than 50,000 tankers each month—before they unload. And that spells protection for silos across the country.

So when you need to spot antibiotics fast, run The SPOT TEST. And get results in 6 minutes.

SPOT TEST™

Results in 6 minutes

ANGENICS
100 Inman Street
Cambridge, MA 02139
1-800 523-2250
(In MA, call collect, 617-876-6468)

Please circle No. 106 on your Reader Service Page