

ISSN:0273-2866
Box 701
Ames, Iowa 50010

UNIVERSITY MICROFILMS
INTERNATIONAL
300 NORTH ZEEB ROAD

ANN ARBOR, MI

48106

June 1986
Vol. 6, No. 6
Pages 229-276
\$6.00

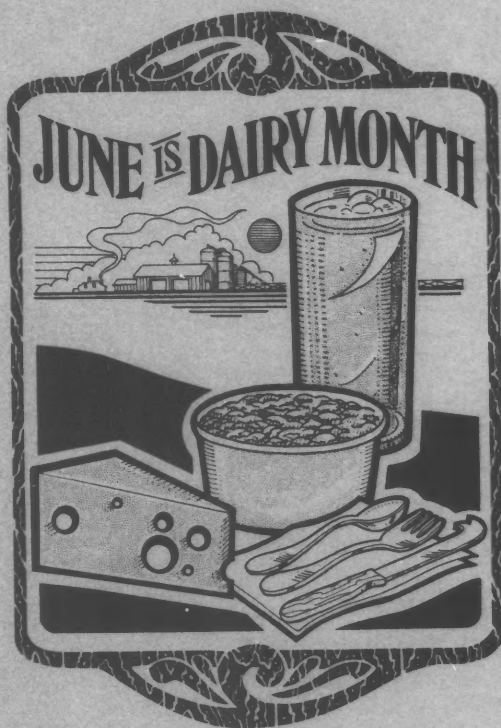
Dairy and Food Sanitation®

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

Milk Industry
Concerns — A
Regulatory Perspective

A Closer Look
at Dairy Safety

Sanitation in the
Food Industry



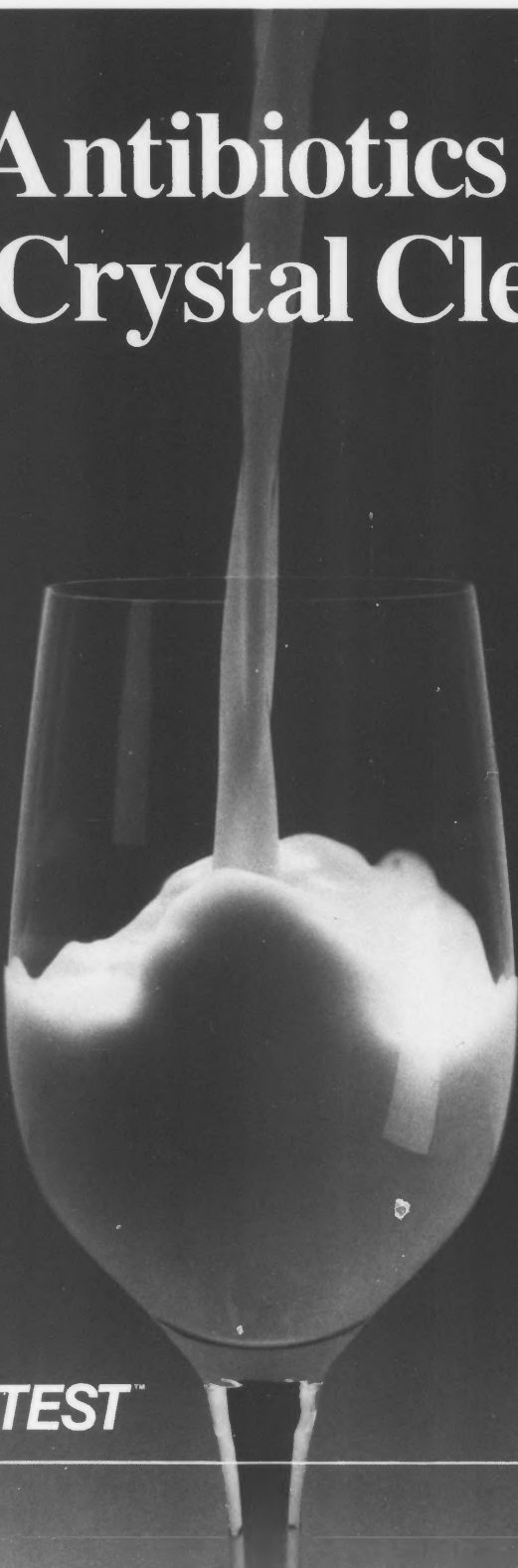
Pesticide Residues in
Meat Animal Production

Quality of Some
Tomato Products

The Bugs that Bug
Inspectors the Most

73rd IAMFES Annual Meeting
August 3-7, 1986
Minneapolis, Minnesota
Registration Forms in this Issue

The Antibiotics Issue Is Crystal Clear



There's only *one* FDA-approved antibiotic test. The 2½ hour *B. steartophilus* disc assay.

And there's only *one* fast, reliable way to predict it. The 6-minute SPOT TEST.

The SPOT TEST screens an average of 50,000 milk tankers each month — with disc correlation unmatched by any quick test.

That's why dairymen across the country count on it for low-cost, trouble-free screening. And now, with a reformulated reagent system, SPOT TEST results are clearer than ever.

Your choice is just as clear. When you need to spot antibiotics fast, run The SPOT TEST. And get results in 6 minutes.

ANGENICS

100 Inman Street
Cambridge, MA 02139
617 876 6468

 **SPOT TEST™**

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

1986 MEMBERSHIP APPLICATION

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

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 \$10 for each Journal ordered for postage

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

1986 SUBSCRIPTION APPLICATION for agencies, associations, and institutions

All subscriptions on a calendar year basis

BEST BUY

- BOTH Journals \$110
 Dairy and Food Sanitation \$60
 Journal of Food Protection \$80

FOREIGN AND CANADA
Add \$10 for each Journal ordered for postage

1986 PUBLICATION ORDER FORM

3-A Sanitary Standards

- () Complete set 3-A Dairy Stds ea \$33
() Complete set 3-A Dairy & Egg Stds ea \$48
() 3-A Egg Stds ea \$28

Five-Year Service on 3-A Sanitary Standards

- () 3-A Dairy & Egg Stds Five years \$34

- Procedures to Investigate Waterborne Illness ea \$3.00
 Procedures to Investigate Foodborne Illness ea \$3.00
 Procedures to Investigate Arthropod-borne and Rodent-borne Illness ea \$3.00

Multiple copies available at reduced price. Prices include postage.

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 800-525-5223
or 515-232-6699
ask for Sandy

IAMFES Sustaining Members

Accurate Metering System

1705 Carmen Dr.
Elk Grove Vlg, IL 60007

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

BBL Microbiology Systems

P.O. Box 243
Cockeysville, MD 21030

Bio-Lab, Inc.

PO Box 1489
Decatur, GA 30031

Borden, Inc.

Dairy & Services Div.
16855 Northchase
Houston, TX 77060

CLN Industries, Inc.

700 Billings, Suite F
Denver, CO 80011

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

Diversy/Wyandotte

1532 Biddle Ave.
Wyandotte, MI 48192

Eastern Crown, Inc.

P.O. Box 216
Vernon, N.Y. 13476

Foss Food Technology Corporation

10355 West 70th St.
Eden Prairie, MN 55344

FRM Chem, Inc.

P.O. Box 207
Washington, MO 63090

GAF

1361 Alps Road
Wayne, NJ 07470

Gerber Products Co.

445 State St.
Fremont, MI 49412

Gibco Laboratories, Inc.

231 Sutton Street
No. Andover, MA 01845

Gist-Brocades USA

P.O. Box 241068
Charlotte, NC 28224

Henkel Corp.

300 Brookside Ave.
Ambler, PA 19002

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

Kienzle Division

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

Maryland & Virginia Milk Prod. Assn., Inc.

P.O. Box 9154 Rosslyn Station
Arlington, Virginia 22209

Mid America Dairymen, Inc.

P.O. Box 1837 SSS
800 W. Tampa
Springfield, MO 65805

Nalge 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

National Sanitation Foundation

P.O. Box 1468
Ann Arbor, MI 48106

Norton Co.

P.O. Box 350
Akron, Ohio 44309

Oxoid USA, Inc.

9017 Red Branch Rd.
Columbia, MD 21045

Penicillin Assays, Inc.

36 Franklin St.
Malden, MA 02148

The Pillsbury Company

311 Second St., S.E.
Minneapolis, MN 55414

Rexham Machinery Group

5501 N. Washington Blvd.
Sarasota, FL 34243

Selberling Associates, Inc.

11415 Main St.
Roscoe, IL 61073

SmithKline Animal Health Products

P.O. Box 2650
West Chester, PA 19380

The Stearns Tech. Textile Co.

100 Williams St.
Cincinnati, OH 45215

3M/Medical-Surgical Div.

225-5S-01
3M Center
St. Paul, MN 55144-1000

Universal Milking Machine Div.

Universal Coops, Inc.
Dairy Equipment Dept.
P.O. Box 460
Minneapolis, MN 55440

Walker Stainless Equipment Co.

601 State St.
New Lisbon, WI 53950

Dairy and Food Sanitation (ISSN:0273-2866) 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.

IAMFES
OFFICERS AND EXECUTIVE BOARD

President, SIDNEY BARNARD, 9 Borland Lab, Pennsylvania State University, University Park, PA 16802.

President-Elect, ROY GINN, Dairy Quality Control Inst., 2353 No. Rice St., Room 110, St. Paul, MN 55113.

Vice-President, LEON TOWNSEND, Milk Control Branch, Bureau for Health Services, 275 East Main St., Frankfort, KY 40601.

Secretary, ROBERT GRAVANI, 8A Stocking Hall, Cornell University, Ithaca, NY 14853.

Past-President, ARCHIE C. HOLLIDAY, VA Dept. of Ag., 1100 Bank St., Room 511, Richmond, VA 23219.

Affiliate Council Chprn., HELENE UHLMAN, 1532 W. 4th Place, Hobart, IN 46342.

EDITORS

KATHY MOORE HATHAWAY, *Editor and Executive Manager*, Box 701, Ames, Iowa 50010

SUZANNE TRCKA, *Associate Editor*, Box 701, Ames, Iowa 50010

HENRY ATHERTON, *Technical Editor*, University of Vermont, Carrigan Hall, Burlington, VT 05405.

EDITORIAL BOARD

K. ANDERSON Ames, IA
 H. V. ATHERTON Burlington, VT
 K. J. BAKER Rockville, MD
 S. BARNARD University Park, PA
 H. BENGSCHE Springfield, MO
 F. BODYFELT Corvallis, OR
 J. BRUHN Davis, CA
 J. BURKETT Sioux City, IA
 J. CHAMBERS West Lafayette, IN
 W. CLARK Chicago, IL
 W. W. COLEMAN St. Paul, MN
 O. D. COOK Rockville, MD
 R. DICKIE Madison, WI
 F. FELDSTEIN Culpeper, VA
 R. FUQUA Mt. Juliet, TN
 J. GERBERICH Eau Claire, WI
 P. HARTMAN Ames, IA
 C. HINZ Le Roy, NY
 C. JELLINGS Clinton, IA
 D. JOLLEY Bradenton, FL
 W. LAGRANGE Ames, IA
 J. LITTLEFIELD Austin, TX
 J. MIRANDA Los Angeles, CA
 D. NEWSLOW Orlando, FL
 D. PEPER Sioux City, IA
 M. PULLEN St. Paul, MN
 J. REEDER Arlington, VA
 D. ROLLINS Springfield, MO
 R. SANDERS Washington, DC
 P. C. VASAVADA River Falls, WI
 E. O. WRIGHT Bella Vista, AR

Dairy and Food Sanitation

CONTENTS Vol. 6 No. 6 June, 1986

ARTICLES

- **Milk Industry Concerns - A Regulatory Perspective** 232
Leon Townsend
- **Pesticides, Meat Animal Production and Residues in Food** 234
Donald E. Mock and Donald C. Cress
- **A Closer Look at Dairy Safety** 240
Chris W. Lecos
- **Quality of Tomato Paste, Sauce, Puree and Catsup** 243
Lester Hankin

NEWS AND EVENTS 246

NEW PRODUCT NEWS 248

FOOD SCIENCE FACTS 250
• Sanitation in the Food Industry

FOOD AND ENVIRONMENTAL HAZARDS TO HEALTH 252

NEW MEMBERS 255

SYNOPSIS OF PAPERS FOR THE IAMFES ANNUAL MEETING 257

ANNUAL MEETING REGISTRATION FORMS 258

BUSINESS EXCHANGE 260

JFP ABSTRACTS 263

READER SERVICE PAGE 267

3A SANITARY STANDARDS 269
• No. 43-00
• No. 40-01

CALENDAR 276

Milk Industry Concerns - A Regulatory Perspective

*Leon Townsend, Manager
Milk Control Branch
Department for Health Services
275 E. Main
Frankfort, Kentucky 40601*

What is the price of safety? What needs to be done to reassure consumers that pasteurized milk and milk products are a remarkably safe food? Are milk regulatory programs at the federal, state and local levels adequate to prevent milkborne disease outbreaks?

These are some of the questions which have surfaced in the past few months, resulting from what appears to be an increase in the number of disease outbreaks attributed to milk products.

According to the Food and Drug Administration (FDA), less than 1% of all outbreaks of food poisoning reported in the past decade have been attributed to milk. Dr. Morris Potter of the federal Centers for Disease Control (CDC) quoted in an Associated Press story said, "If one looks at the total volume of pasteurized milk consumed, the attack rate is very, very low. Pasteurized milk is a safe food." (1)

Even though milk is responsible for such a small percentage of food related disease outbreaks, those of us who have devoted much of our lives to assuring consumers that milk is the safest source of food in the United States are concerned. Of equal or greater concern is the dairy industry and the National Conference on Interstate Milk Shipments (NCIMS).

The NCIMS is a voluntary organi-

zation directed and controlled by the member States and open to all persons interested in its objective of promoting the availability of a high quality milk supply. It is governed by an Executive Board whose members include representatives from state departments of health and agriculture, the FDA, the U.S. Department of Agriculture, and industry.

Through their collaborative efforts, the FDA and the NCIMS have developed a cooperative, federal-state program (the Interstate Milk Shipper Program) to ensure the sanitary quality of milk and milk products shipped interstate. The Program is operated primarily by the States, with FDA providing varying degrees of scientific, technical and inspection assistance. The result has been the establishment of a viable and effective certification and enforcement program which has been of significant benefit to consumers. (2)

The most significant milkborne disease outbreaks and related incidents which have occurred in the 80's include:

- Yersinosis in Tennessee, Arkansas and Mississippi - 1982
- Listeriosis in Massachusetts - July/August 1985, and in California - May/June, 1985
- Salmonellosis in Illinois - March/April, 1985
- Staphylococcal Enterotoxin in Kentucky - September, 1985

- Contamination of milk with cleaning solutions in Florida and California, 1984 and 85
- Recall of French Brie Cheese - 1986 (Listeriosis contamination)

The apparent increase of milk related incidents and more specifically the number recorded during 1985, coupled with the "Granddaddy" of them all - The Hillfarm Dairy Salmonellosis Outbreak, Melrose Park, Illinois - from which over 16,000 cultured confirmed cases were isolated has proliferated much concern.

At the invitation of FDA, a two day meeting was held September 17-18, 1985, in Washington, D.C., among FDA's Milk Safety Branch, NCIMS/FDA Liaison Committee, Chairman NCIMS, National Milk Producers Federation and American Dry Milk Institute.

During this two day discussion, many concerns felt to have some bearing on recent milkborne illnesses were expressed. A partial listing follows:

1. Do we know ramifications of new industry installations/processes?
 - (a) Are regulatory people adequately examining new processes?
 - (b) Is industry providing sufficient documentation of effectiveness of new equipment/processes, etc.?
 - (c) Are Pasteurized Milk

Ordinance (PMO) requirements regarding plant modifications being enforced? (3)

(d) Is there sufficient expertise for equipment review by FDA and states?

(e) Is better control of plant modifications needed by regulatory agencies?

2. Are industry operators/supervisors adequately trained in public health principles?

(a) Needed training is not being provided at universities in many areas.

(b) PMO requirements may not be familiar to industry management and operators.

(c) Is there a need to train and certify plant HTST operators?

3. Have regulatory budget constraints and program reductions played a part or contributed to the problem?

(a) Has the trend away from specialists to generalists in regulatory programs caused ineffectiveness?

(b) Has reduced number of regulatory inspections allowed industry to relax quality standards?

(c) Is there too much emphasis on quantity in place of quality inspections?

4. Is there a need to stress the importance of adequately trained and experienced inspectors?

(a) Is additional training for generalists needed?

(b) Is more specialization needed?

5. How many plants have potential blending or cross connection problems? Do we know?

(a) Are there alternatives to blending approaches?

(b) Are present PMO required controls adequate to ensure prevention of post pasteurization contamination?

6. How is reclaimed milk being handled?

7. How effective are our milk

tanker cleaning/sanitizing requirements?

8. Should we be more concerned about what products are being back hauled in milk trucks?

9. Are equipment maintenance requirements adequate? Do regulatory ratings/check ratings adequately evaluate equipment?

10. Are pinholes and defects in HTST regenerator plates a problem?

11. What is to be done to provide adequate training of regulatory and industry personnel?

12. Is the amount of training by FDA's State Training Branch sufficient?

13. Could the NCIMS develop a mechanism or standard course to assist FDA's State Training Branch?

14. Will there be increased industry adverse actions under provisions of NCIMS due to more intensified inspections/check ratings by regulatory agencies?

15. Have we become too comfortable and developed the feeling that nothing will go wrong with our dairy products?

From this meeting in September, FDA developed Dairy Program Initiatives (4) and the Agency Compliance Program for 1986.

Under the capable and dedicated leadership of Jerry Kozak, Chief, FDA's Milk Safety Branch, a two week "Advanced Training for Milk Specialists" was held in Lexington, Kentucky, in February, 1986.

Course objectives were to increase the proficiency of Milk Specialists in the areas of new technologies and to emphasize trouble-shooting in pasteurization plants as it relates to preventing future problems.

In addition to many hours of classroom instruction (including several night sessions as well as weekends) hands-on plant training was conducted at Winchester Farms Dairy and Nutrisearch International, Winchester, Kentucky, and The Kroger

Technical Center, Highland Heights, Kentucky. Also, a simulated Check Rating was conducted at Borden, Inc., Lexington, Kentucky. The contribution made by these companies represents the "Utopia" of regulatory/industry cooperation.

The privilege to attend this workshop as a state milk regulatory official will no doubt remain one of the highlights of my 28 year public health career.

I was most pleased with the general agreement between Milk Specialists from all FDA Regions and the desire on the part of the Milk Safety Branch staff to provide leadership and promote standardization.

FDA response from this workshop to state and local milk regulatory agencies will be forthcoming in three basic areas:

(a) Questions and Answers - as presently submitted from Regional Seminars for State Milk Sanitation Rating Officers

(b) M-a coded memoranda (PMO interpretations)

(c) Problems submitted to the '87 NCIMS for needed PMO revisions.

The attitude of the Milk Safety Branch that professional judgement and rationale be used in future check ratings under the new initiatives is most encouraging. The events of the past several months is not cause for panic, but a reason for concern, reevaluation and program compliance to the fullest.

With the dedicated efforts of FDA, state and local regulatory agencies and the dairy industry, the NCIMS objective to "Promote the Best Possible Milk Supply for all the People" will continue to be met.

REFERENCES

1. Hoard's Dairymen, Volume 130, No. 10, May 25, 1985.
2. FDA Publication No. 72-2022, Procedures Governing the Cooperative Federal-State Program for Certification of Interstate Milk Shippers, 1985 edition.
3. Pasteurized Milk Ordinance, USPHS/FDA, 2nd edition 1985, Government Printing Office, Washington, D.C.
4. Dairy and Food Sanitation, Volume 6, No. 5, May, 1986.

Pesticides, Meat Animal Production and Residues in Food

Donald E. Mock

Extension Specialist, Livestock Entomology
Department of Entomology
Kansas State University
Manhattan, Kansas 66506

and

Donald C. Cress

Extension Pesticide Coordinator
Department of Entomology
Kansas State University
Manhattan, Kansas 66506

Need for Pesticide Use

Animal Production. Production of any meat animal species is accompanied by problems with destructive insect, disease, and/or weed pests. Beef and dairy animals are beset by horn flies, face flies, screwworms, ticks, cattle grubs (heel flies), stable flies, scabies mites and other pests. Without pest control, swine suffer from infestations of mange mites, lice, and various fly species. Sheep production is hampered by losses from keds (sheep ticks), lice, ticks, blow fly strike, head bots, and black flies. Broiler and egg production losses occur from fowl mites, feather mites, and lice. In addition, neighborhoods surrounding livestock production facilities demand control of house flies and stable flies that breed in animal manure (4,17).

Many of the arthropod pests of livestock are carriers of animal and human diseases, thus compounding the seriousness of their impact (4,17).

Feed Production. Pasture and range weeds compete with desirable forage plants. Some are poisonous to livestock and cause abortion, birth deformities, or death (2,7).

Livestock production depends upon a reliable and economical supply of feed grain and forage crops. These crops incur competition and damage from a wide array of insect, plant disease, and weed pests from planting time through harvest and even in storage (2,8,16).

Officials estimate annual U.S. losses of over \$20 billion from crop plant pests and nearly \$4 billion from arthropod pests of livestock (2,4,8,15). Not only are the livelihoods of farmers and ranchers at stake, but so is

the welfare of all Americans and people throughout the world who depend on food from the United States. Hence, such insect, plant disease, and weed pests must be controlled. Despite much progress in the use of alternative pest management methods, severe pest outbreaks still occur. Chemical pesticides are generally fast acting, comparatively inexpensive, and readily available. But, no matter what stage of the production system a pesticide is used in, it could potentially result in residues in meat, milk, eggs or other food items.

It is the collective responsibility of the government, the pesticide industry, and individual pesticide users to ensure that pesticides used to maintain an adequate food supply do not result in an unsafe food supply.

Pesticide Residues and Tolerances

What are Pesticide Residues? The pesticide which remains in or on food or feed is called a residue. Many times a long-lasting residue is desirable for long-term pest control. Residues which may remain in food or feed at harvest or slaughter, however, are carefully monitored to avoid hazards to the humans and domestic animals which will eat them.

Consideration of some chemical and physical characteristics of pesticides and of environmental factors acting on pesticides is in order. Useful persistence of a pesticide on the target site, and potentially harmful residues in meat or milk, are dependent upon many factors.

First is the chemical stability of the active ingredient. This is affected by the nature of the carrier and other chemicals in the formulation of the product. Each pesticide has an inherent potential for persistence or nonpersistence. Other factors including the application rate, placement, frequency of application, and the permeability of the target site regulate the expression of that inherent degree of persistence. Once on the target site, ultraviolet light (sunlight), rain and moisture, alkalinity or acidity, and microbial action begin to detoxify and destroy the material. These influences affect each pesticide according to its inherent stability.

Pesticides applied directly to the animal are considered *systemic* if they are readily absorbed into the skin, transported in the circulatory system, and not rapidly destroyed by the animal's metabolic processes. Pesticides

which are applied directly to the animal but are either not readily absorbed through the skin or are rapidly broken down in the animal's metabolic processes are considered *nonsystemic* (contact) pesticides.

Finally, the likelihood of residues occurring in meat or milk depends on the pesticide surviving the foregoing processes, entering the animal through dermal (skin) absorption, orally (from licking), or by inhalation, and by whether that specific pesticide is stored in animal tissue or rapidly voided in the urine or feces.

Before any product can be legally marketed as a pesticide it must be registered with the Environmental Protection Agency (EPA). To meet registration requirements, the manufacturer must perform exhaustive testing for efficacy and safety. The foregoing factors influencing the fate of each candidate pesticide are studied. When the material is registered by the EPA, the "Use Directions" on the label will be based on those factors. *The label, together with any literature to which it refers, has the force of law.* It is unlawful to detach, alter, deface or destroy the label. *Used as directed*, the pesticide will not result in residues (or any health threatening degradation products thereof) exceeding legal tolerances in meat or animal products such as milk and eggs.

What are Pesticide Tolerances? The EPA sets pesticide residue tolerances for all crop and animal products intended for food or feed. A tolerance is the maximum amount of pesticide residue which may remain on or in treated crops and animals that are to be sold for food or feed. These tolerances are determined by extensive testing. To insure safety, the levels usually are set at least 100 times lower than the known "no-effect level." If the residue exceeds the tolerance, the food or feed may not be marketed or sold.

In some cases, degradation products resulting from a pesticide's breakdown have been found at certain concentrations to be toxic, carcinogenic, or otherwise health threatening. In such cases the regulatory procedures described above, relative to pesticide residues, also apply to pesticide degradation compounds.

A pesticide applicator cannot measure residues on crops and livestock, because such measurements require highly specialized equipment and techniques. Only by following label instructions exactly can one be sure that treated products will have residues well below the tolerance level when marketed. Especially important are instructions on correct dosages and on minimum days to harvest, slaughter, or grazing.

Consumer Concerns About Residues

As discussed above, residues are detectable pesticidal chemicals remaining after application. Indeed, it is these residues which adversely affect the pest, i.e. kill, sterilize, repel, or otherwise "control" the pest.

In some cases, a long term residue, referred to as "long residual activity", is highly desirable. An example is in termite control where a single treatment of the soil

around a building's foundation forms a "chemical barrier" (residue) that may last for 30 years or more. An example of moderately long residual activity is in "at planting" or "preplant" applications of pesticides (herbicides, fungicides, insecticides, nematicides, etc.) which provide season-long protection against various pests. When "long residual" chemicals are applied according to label directions, 1) long-term pest control is obtained, 2) applicator exposure is reduced because fewer applications are made (compared to short residual chemicals, and 3) adverse environmental impact is minimal.

In many cases, however, short residual activity is absolutely necessary. "Short residual activity" is a relative term, but it is generally thought of as less than 14 days. Short residual pesticides are used in most pest control programs around food processing plants. Indeed pyrethrin, an insecticide commonly used for fly control in food processing plants, is effective for less than 24 hours.

Residues are a consumer concern because they are poisons and, under experimental conditions, some pesticides have been linked to cancer, birth defects, etc. in laboratory test animals. Some are more potent than others. Rodenticides and insecticides act on humans in much the same way as they do on the target pest, affecting the nervous system, stomach, etc. Other classes of pesticides, such as herbicides and fungicides, are chemicals "designed" to adversely affect plant and fungus systems and are generally less toxic to animal systems (3).

Pesticide Monitoring

Residue Sampling. Sampling for residues begins when a raw agricultural product enters the channels of commerce. The distribution of responsibilities among government agencies is complex, but in general it is the Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture (USDA) that monitors animal carcasses and poultry after slaughter, and both fresh and processed meats, for pesticide residues exceeding tolerances. Eggs, milk, and cheeses are monitored by other divisions of the USDA. The Food and Drug Administration assists in tracing the source of residues when violations are detected by the FSIS in animal products. The FDA also monitors for pesticide residues in canned and frozen foods and many other food items.

A pesticide label may say, "Do not apply within 10 days of harvest" or "do not apply within 5 days of slaughter." If the label directions are followed, residue levels will be acceptable when the food or feed is sampled. Residue sampling continues throughout the food and feed processing and distribution systems up to the point where the consumer purchases the end product. If illegal residues are detected at any point along the line, the food or feed is immediately seized and the source of the illegal residues is determined. Heavy regulatory penalties, including fines and imprisonment, are imposed and the contaminated material is disposed of properly.

Residues are measured in parts per million (ppm), parts per billion (ppb) and, as technology allows, parts per trillion (ppt). The following examples illustrate how tiny these residue amounts are: 1 ppm is 1 inch in 16 miles, 1 ppb is 1 inch in 16,000 miles and 1 ppt is 1 inch in 16,000,000 miles (642.6 times around the earth at the equator).

Traceability to Source. The government residue sampling procedure allows for traceability should illegal residues show up. Regulatory agencies have the authority to sample food (raw and processed) for pesticide residues at any time after the commodity enters the channels of commerce. Because it is physically impossible to sample every food item (animal, cut of meat, gallon of milk, egg), both unannounced and routine spot samplings are conducted. The following example illustrates the conceptual system. Fifty calves are sold to a feedlot. Samples for residues are "clean" (legal) and the producer gets paid. The animals are fed for 140 days and sent to slaughter - samples are "clean." The feedlot operator gets paid. The animals are slaughtered and processing begins. Twenty carcasses go to processor A and 30 go to B. For simplicity, suppose processor A makes hamburger. Residue samples are taken and show illegal levels of pesticide residue. The regulatory agency (FDA) seizes the hamburger, checks the records and finds the meat was "clean" from the producer through the slaughterhouse; therefore, the contamination came while in possession of processor A. Regulatory action is taken.

Residue Avoidance: Alternatives to Pesticides

Farmers and ranchers have long recognized the value of nonchemical approaches to preventing or controlling pests. Cultivation is older than herbicides as a weed control method. Crop rotation is used to help control weeds, insects, and diseases. Animals are groomed and their bedding changed partially to control insect and mite pests. Controlled timing and rate of pasture use, pasture rotation and grassland burning are a few of the tools of range management which reduce numbers of some livestock pest species. Most of these methods are not so much *alternatives* that replace pesticides as they are useful *adjuncts* to pesticide use which reduce the amount of pesticide needed.

In recent years, livestock producers have joined others in the use of integrated pest management (IPM). IPM is a concept in which old and new ideas are blended harmoniously, using carefully selected combinations of cultural, physical, biological and chemical methods to control pests (1). Some examples follow:

Sanitation is a key element in preventing and controlling livestock pests. Not only does sanitation reduce the need and frequency of pesticide use, but without sanitation no pesticide use program can be completely successful in confinement operations.

The main factor in sanitation is waste management including manure handling and proper disposal of dead animals, afterbirth and other animal matter such as the products of docking, castration, dehorning and ear notching.

Manure is removed and scattered on fields or piled and packed in a mound to reduce fly populations and promote rain water runoff. House flies can develop from egg to adult in fewer than 7 days, so weekly or more frequent manure disposal is advised throughout the warm months. On small farms, some farmers harrow the pasture frequently to break up cow dung pats and reduce survival of horn fly, face fly and stable fly larvae. Modern slatted floor livestock rearing pens with liquid manure systems also must be properly designed and maintained to prevent fly problems.

Wet spots and low areas where manure stays wet are the primary sources of fly production. Feed spills around feeders and bunks as well as wet hay and bedding are also sites for maggot development. Cattle and hog producers find that eliminating such decaying plant materials is especially important in controlling the blood-sucking stable fly. Care in designing, building and maintaining facilities for feed, water and livestock handling can "build out" corners and crannies which are difficult to clean.

Screening and other structural barriers are employed in modern poultry, dairy and swine production units to control flies.

Isolation of incoming animals which may be carrying mange or scabies, lice and ticks can prevent transfer of such parasites to other animals. Infested animals are treated and elimination of their pests is verified before they are mixed with the rest of the herd or flock. To prevent reinfestation, many livestock breeding operations maintain "closed herds" after eliminating such obligate parasites. This practice markedly reduces further need for pesticides.

Biological control by natural enemies of livestock pests occurs constantly without our notice. Many beetle species and beneficial mites prey on fly eggs and larvae; various tiny wasps parasitize fly pupae. Without these beneficial creatures, pest problems would be much worse than they are. Entomologists have learned how to manipulate such natural control agents to provide satisfactory pest control in rigorously managed poultry production units and some types of dairy operations (11,12). Although parasitic wasps are sold to many swine and beef cattle feedlots for fly control, such efforts have thus far provided little benefit in most parts of the country (14). As biological control technology advances, other types of livestock operations may be able to incorporate biological control more fully into their pest management practices.

Genetic resistance to pests has become an important means of protection for many crop plant species. The development of genetic resistance is just beginning to receive attention in livestock breeding. *Bos indicus* (Brahman and Zebu) cattle have been heavily utilized in South America, the southern United States and in

Australia for their resistance to ticks. Recent USDA work has shown unrestrained Brahman calves and Brahman/Hereford crossbreed calves to be refractory to the establishment of psoroptic scabies (5, and pers. comm. W. F. Fisher, Oct. 23, 1985). Certain genetic lines of Leghorn hens are found to have resistance to northern fowl mite infestations (10). Possibly, resistance factors can be genetically transferred to other breeds of animals. Perhaps resistance to additional pests can be developed in cattle and other classes of livestock, but there are limitations. These methods generally take a long time to develop. Also, just as insect pests often develop resistance to insecticides, they sometimes adapt to formerly resistant host animals or plants.

Health maintenance is an important aspect of reducing susceptibility of livestock to pest infestations and of reducing the negative effect of pests and parasites that do attack them. Correct nutrition and adequate shelter from extreme heat and cold are foremost in maintaining animal health. Adequate space avoids stress from overcrowding and allows freedom of movement for self and mutual grooming. Cattle lice and scabies develop much more rapidly in conditions where the host animals are restricted from grooming (6,9). Good animal health also is facilitated by control of rats, mice and nuisance birds.

Proper Use of Pesticides

Pest identification, biology and behavior. First and foremost in the use of any pesticide is the correct identification of the pest. Once the identity of the pest is known, the next important information, its biology and behavior, is available from research publications.

The importance of specific pest identification can be illustrated using flies as an example. Many species of flies are pests of livestock. Therefore, an identification of the pest as being a "fly" is meaningless because each species' biology and behavior is different. For this illustration let's just compare the horn fly, face fly and stable fly.

Breeding site: Horn fly eggs are deposited on very fresh (still warm) cow manure; face fly eggs are deposited on moist manure (which may be 2 to 3 days old); stable fly eggs are deposited in decomposing plant matter (straw soaked with urine and manure, compost, piles of grass) but not manure alone (17). The maggots develop where the eggs were deposited and ultimately the adult flies emerge. Hence, to control maggots the sanitary practices or insecticide treatments are determined by the breeding site.

Adult behavior: Horn fly adults feed on blood primarily from along the back line and shoulders of cattle; face fly adults are found on the animal's "face," i.e., eyes, nose, mouth where they feed on mucous secretions; and stable fly adults suck animal blood - biting mostly at knee level or below. As can be seen, the species of "fly" determines where an insecticide must be applied on the animals if it is to be effective.

Pesticide selection follows pest identification. Careful selection is needed for a pesticide which will control the pest yet be safe to the applicator, livestock and environment, and leave no illegal residue.

The first step in the selection is to read the label(s) to be sure both the intended *site* of application, whether direct animal (beef, swine, poultry, etc.), livestock premises or milk rooms, and *pest*, e.g., horn flies, ticks, lice, are on the label. Second, read the *restrictions* such as "Remove all animals before application," "Do not apply to animals under 6 months old," "Do not apply to Brahman cattle," to be sure the product can be used as intended (see "Withdrawal Periods" below). Third, consider the *formulation*, i.e., wettable powder, dust, emulsifiable concentrate, bait, etc. There may be two or more formulations of the same active ingredient. This leads to considering factors such as cost, weather conditions (sprays freeze in the winter), available equipment, method of application (dust bags, baits, feed through), number of applications, etc.

This discussion of pesticide selection is not a complete step by step analysis; but, rather, is intended to point out some of the major considerations. The pesticide user has the responsibility of checking reliable sources of information, such as extension personnel, product labels, pesticide dealers, etc. to select the best possible pesticide for each intended use.

Pesticide mixing, dosage and timing. In general, the most hazardous phase of applying pesticides is the *mixing* phase. This is because the applicator must handle a highly concentrated form (often over 50 percent active ingredient) of the pesticide. Protective equipment is most essential while mixing.

In the mixing phase water or other carriers are added to a concentrated pesticide product to form a more dilute mixture that will be applied. Great care in following all label instructions is a must. Inaccurate measurements lead to 1) possible illegal residues, 2) waste of chemical, 3) poor pest control or 4) poisoned livestock. The amount of pesticide to use for each site and pest is shown on the label.

Timing the application to be most effective is a key factor in pest control. Applications can be either too early or too late to be effective. Timing factors vary with the pest and are influenced by temperature, moisture, food source, natural enemies and other local factors. Computer programs are being developed to aid applicators in the accurate timing of applications. In the meantime, applicators should continue to consult extension personnel, pesticide labels and chemical dealers for advice on timing pesticide applications.

Withdrawal period refers to the time it takes for the pesticide residue to break down to a level below the established tolerance. The withdrawal period is the number of days from the last pesticide application to sale or slaughter. Withdrawal periods range from 0 days to several weeks. The withdrawal period, or rate of breakdown, depends on the active ingredient, rate of application, for-

mulation, site of application and other factors, all of which are taken into account in gathering the support data required by the EPA and the FDA when a product is registered. The withdrawal periods are stated on the label for each registered use and must be strictly observed to avoid illegal residues.

Examples of Pesticide Use Decisions

Direct animal treatment indicates that a pesticide is applied directly to animals. This may be done in hundreds of ways involving many formulations and use rates and various methods of application - dipping, spraying, dusting, pour-ons, etc. The application may range from total immersion (dipping) of cattle with a long residual chlorinated hydrocarbon insecticide such as toxaphene (28-day withdrawal) or lindane (60-day withdrawal) to a light spraying of a very short residual material such as pyrethrin (a botanical) or DDVP (an organophosphorous insecticide) for which there are 0-day required withdrawal periods. If there is no extra benefit to be gained by using the "heaviest" treatment, then the "light" treatment should be chosen.

For control of lice or ticks, one may spray animals with any of several materials including some which are also systemic and some which are not. Some of the non-systemic insecticides are just as effective and would be the preferred choice as they are less likely to result in residues in the meat. Such considerations become especially important when nearing market time.

Premise treatment. Treatment of barns and pens is allowed with some insecticides which are not registered for direct use on animals. Illegal residues may result 1) when the wrong chemicals are used on premises, 2) if excessive application results in runoff that the animals may drink, 3) if the animals are not removed during premise treatment, or 4) if proper care is not taken to avoid contaminating feed and water during treatment.

Feed additives (oral larvicides). One way of controlling fly species that breed in livestock manure is by mixing small amounts of suitable insecticides into animal rations so that the resulting manure is pretreated. This is commonly referred to as the "feed through" method. Of course, only a few insecticides (e.g., those with relatively low mammalian toxicity which are minimally affected by digestion and are not readily absorbed in the digestive tract) can be used in this way. One currently in use is methoprene (or Altosid^(R) in Moorman's IGR Products) available in mineral mixes and blocks for beef and dairy cattle. Another is tetrachlorvinphos which is available as Rabon^(R) Oral Larvicide in premixed feeds, blocks, and mineral formulations for beef and dairy cattle and as Swine Oral Larvicide^(R) for swine. No pre-slaughter or pre-lactation waiting intervals are required for these two materials. Improper mixing or overdosing could conceivably result in illegal amounts of residues in food. Also animal poisoning or illegal residues could result if live-

stock should gain access to stored insecticides not yet diluted into the ration.

Treatment of feed crops. Residues in meat or milk may result from crop pesticides drifting or accidentally sprayed onto forage or pasture. These may be materials never intended for use either on such crops or directly on animals. A common route of chemical entry into animal roughage feeds is the harvesting of hay or forage that may have been treated with the proper chemical but harvested before the required waiting interval. An example is the common need for treating alfalfa fields to control alfalfa weevils. Many insecticides are available for this use, and some require no waiting interval. A popular insecticide for alfalfa weevil control in recent years has been carbofuran (Furadan^(R) 4F). Depending on the labeled rate used, withdrawal periods range from 7 days at the lowest rate to 28 days at the maximum rate. Even the low rate gives good control in most situations; and if this insecticide is chosen for weevil control near hay cutting time, only the low rate should be used. However, some applicators have been known to use the full pound rate to assure the "best control job" without consulting the producer as to his planned harvest schedule. Communication between the applicator and producer is important. One who buys hay should insist on knowing the history of pesticide treatment - what products, when, and how much.

Similarly, residues from field treated feed grain crops end up as residues in meat. For example, dimethoate (Cygon^(R)), commonly used for spider mite control on corn, has one of the longer required waiting intervals of 42 days before grain harvest. Aldicarb (Temik^(R) 15G), which may be applied at planting time to grain sorghum or soybeans, has an even longer required waiting interval of 90 days before harvest, and green forage is not to be fed at all. This is ordinarily no problem because both grain sorghum and soybeans require more than 90 days to mature. Trouble could result, however, if early summer drought caused a farmer to salvage what he could by making fodder of his milo crop or allowing livestock to graze the soybeans before 90 days had passed.

Finally, stored grain may be treated with fumigants and certain other insecticides to prevent excessive damage by granary pests. Improper application to stored grain, failure to aerate the grain before using it as feed, and using it before required waiting intervals have passed could result in poisoned animals and/or illegal residues in meat, milk, or eggs.

The mention of commercial products in this publication implies neither their approval nor disapproval as compared to other products not named.

REFERENCES

1. Bottrell, D. R. 1979. Integrated pest management. Council on Environmental Quality. U.S. Government Printing Office, Washington, D.C. xv + 120 p.
2. Chandler, J. M. 1981. Estimated losses of crops to weeds. p. 95-109. In D. Pimentel (ed.). Handbook of Pest Management in Agriculture. Vol. I, CRC Press, Inc., Boca Raton, FL.

3. Cress, D. C. and J. Doull. 1981. Pesticides. C-641, Coop. Ext. Serv., Kansas State Univ., Manhattan, KS. 12 p.
4. Drummond, R. O., G. Lambert, H. E. Smalley, Jr., and C. E. Terrill. 1981. Estimated losses of livestock to pests. p. 111-135. *In* D. Pimentel (ed.). Handbook of Pest Management in Agriculture. Vol. I, CRC Press Inc., Boca Raton, FL.
5. Fisher, W. F. and F. C. Wright. 1981. Susceptibility of scabies-naive Hereford and Brahman calves to *Psoroptes ovis* infestations. *Southwestern Entomologist* 6(1):57-61.
6. Guillot, F. S. 1981. Susceptibility of Hereford cattle to sheep scab mites after recovery from psoroptic scabies. *J. Econ. Entomol.* 74(6):653-657.
7. James, L. F., R. F. Keeler, A. E. Johnson, M. C. Williams, E. H. Cronin, and J. D. Olsen. 1980. Plants poisonous to livestock in the western states. U.S. Department of Agriculture, Agric. Info. Bull. 415. 90 p.
8. James, W. C. 1981. Estimated losses of crops from plant pathogens. p. 79-94. *In* D. Pimentel (ed.). Handbook of Pest Management in Agriculture. Vol. I, CRC Press, Inc., Boca Raton, FL.
9. Lewis, L. F., D. M. Christenson, and G. W. Eddy. 1967. Rearing the long-nosed cattle louse and cattle biting louse on host animals in Oregon. *J. Econ. Entomol.* 60(3):755-757.
10. Matthyse, J. G., C. J. Jones, and A. Purnasiri. 1974. Development of northern fowl mite populations on chickens, effects on the host, and immunology. *Search.* Cornell Univ., Ithaca, NY. 4(9):1-39.
11. Morgan, P. B. 1981. The potential use of parasites to control *Musca domestica* L. and other filth breeding flies at agricultural installations in the southern United States. pp. 11-25. *In* Proc. Workshop Status Biol. Control Filth Flies, Gainesville, FL. February 4-5, 1981. 212 p.
12. Morgan, P. B., R. S. Patterson, and G. C. LaBrecque. 1976. Controlling house flies at a dairy installation by releasing a protelean parasitoid, *Spalangia endius* (Hymenoptera: Pteromalidae). *J. Georgia Entomol. Soc.* 11:36-39.
13. Nelson, W. A., J. F. Bell, C. M. Clifford, and J. E. Keirans. 1977. Interaction of ectoparasites and their hosts. *J. Med. Entomol.* 13(4-5):389-428.
14. Petersen, J. J., J. A. Meyer, D. A. Stage, and P. B. Morgan. 1983. Evaluation of sequential releases of *Spalangia endius* (Hymenoptera: Pteromalidae) for control of house flies and stable flies (Diptera: Muscidae) associated with confined livestock in Eastern Nebraska. *J. Econ. Entomol.* 76(2):283-6.
15. Pimentel, D. 1981. Introduction. p. 3-11. *In* D. Pimentel (ed.). Handbook of Pest Management in Agriculture. Vol. I, CRC Press, Inc., Boca Raton, FL.
16. Schwartz, P. H. and W. Klassen. 1981. Estimate of losses caused by insects and mites to agricultural crops. p. 15-77. *In* D. Pimentel (ed.). Handbook of Pest Management in Agriculture. Vol. I. CRC Press, Inc., Boca Raton, FL.
17. Williams, R. E., R. D. Hall, A. B. Broce, and P. J. Scholl (ed.). 1985. *Livestock Entomology.* John Wiley and Sons, New York. x + 335 p.

WHO CAN REBUILD YOUR DAIRY EQUIPMENT?

We can rebuild all types of dairy equipment, worn out completely beyond repair with minimum downtime and better efficiency.

We would like to introduce you to Atco's money-saving and fast dependable program. We are complete specialists in the dairy equipment. We can rebuild all types of pumps, freezer barrels, valves, packing machine equipment, all types of refrigeration equipment, all types of heating exchangers, thermutators, all types of Voghtators, homogenizers, and any other type of equipment that

is used in the dairy industry. We can build up all this type of equipment when it is completely beyond repair and can bring it back to OEM specs.

Please feel free to give ATCO a call and check our prices against OEM prices. We can also rebuild any make, model or size equipment. We, at ATCO, have a special NCB process for better life and

better efficiency. Feel free to call us anytime, anyplace, anywhere, 365 days a year, 7 days a week, 24 hours a day on call to serve you. Call 1/800-348-1020; in Texas call collect 713/995-8434; in Dallas area call 214/269-5054.

ATCO offers free pick-up and delivery anywhere — anyplace. ATCO has various locations coast-to-coast.



"It's" ATCO Engineering and Rebuilding

FINALLY

**FINALLY
SOMEONE**

FINALLY

Please circle No. 107 on your Reader Service Page

A Closer Look at Dairy Safety

by Chris W. Lecos

200 C Street SW
Washington, D.C. 20204

Reprinted from the April, 1986 FDA Consumer

Confronted with a recent flurry of food poisoning outbreaks involving contaminated milk and cheese, FDA has called for increased surveillance of the nation's dairy industry.

Two major outbreaks in the Midwest and in California in 1985 and several other incidents in recent years led FDA to conclude that greater efforts by industry and federal and state regulators are needed to make sure such incidents don't continue.

More intensive training programs for federal and state inspectors, educational programs for dairy industry personnel on the potential dangers to milk products from pathogenic (disease-causing) organisms, and more thorough inspections of the country's dairy plants and other dairy operations were urged by FDA in a five-page memorandum sent to state regulatory and dairy officials in December.

Although many food safety and adulteration provisions found in federal law apply to milk and other dairy products, the day-to-day responsibility for monitoring the industry - from the dairy farm to the finished product - rests primarily with state and local public health and regulatory agencies.

Agency officials said a main objective of the new federal initiative was to work with and to encourage state regulatory agencies and the industry in identifying and eliminating any unknown problems in the production of dairy products to prevent new food poisoning outbreaks.

Should people be concerned about the continued safety of the milk supply? According to Jerome J. Kozak,

chief of FDA's milk safety branch in Washington, D.C., "The answer, unequivocally, is no. I am not at all concerned about the integrity of the nation's milk supply, but I am concerned about the unknown - what we don't know.

"FDA is not saying there is a major crisis in the dairy industry," he added. "These initiatives are not being undertaken because there is a known, serious problem in the industry. The agency's purpose is to identify problems that *may* exist. We need to understand whether there is a pattern developing or whether these outbreaks were isolated incidents. We don't have as much information as we should have, and we need to make intelligent decisions based on good data."

FDA officials also emphasize that, despite the recent outbreaks, milk is one of the safest foods consumed by Americans. In 1938, for example, milk caused about one-fourth of all illnesses due to contaminated foods and water. Today, milk and fluid milk products are associated with less than 1 percent of all such outbreaks.

Milk is probably more closely regulated at the federal and state levels than any other food. But, occasional outbreaks of illness do occur. The most serious of recent years occurred last spring and summer. Contaminated low-fat milk produced by a Chicago-area dairy in March and April of 1985 resulted in the worst *Salmonella* outbreak in U.S. history. More than 16,000 persons in six midwestern states - most of them in Illinois - were stricken. The *Salmonella* organism caused the deaths of two persons and probably contributed to the deaths of four or five others, according to officials (see "Of Microbes and Milk: Probing America's Worst *Salmonella* Outbreak" in

the February 1986 FDA Consumer, also reprinted in the April 1986 issue of *Dairy and Food Sanitation*).

An outbreak of another bacterial disease, listeriosis, was blamed for the deaths of 84 people and more than 150 illnesses in California last year. Most of those who died were unborn and newborn babies of Hispanic mothers. The epidemic, investigators said, was linked to the consumption of a soft, Mexican-style cheese. The outbreak prompted FDA to undertake a national survey and product sampling program of soft cheese manufacturers throughout the country.

In February 1986, six brands of imported French Brie soft cheese were recalled after FDA found that they were contaminated with *Listeria monocytogenes*, the bacteria that cause listeriosis. Although some illnesses were reported, the agency couldn't be sure they were caused by the cheese. As of mid-February, FDA also was testing other brands of imported French Brie to see if any more were contaminated.

FDA's memorandum also mentions several other incidents: a listeriosis outbreak in Massachusetts in 1983 in which some 49 illnesses and 14 deaths were linked to pasteurized whole or 2 percent milk; a yersiniosis outbreak involving pasteurized milk that affected some 172 people in Tennessee, Arkansas and Mississippi in July 1982; staphylococcal enterotoxin contamination of chocolate milk in 1985 that caused at least 860 pupils in the Meade County, Kentucky, school system to become ill; and contamination of milk with cleaning solutions in Florida and California, also in 1985. The numbers of those who became ill are based on cases reported to health authorities and where the contaminating

organisms are identified through laboratory analysis. The actual number who became ill probably was higher, since many people don't report their food-borne illnesses.

The exact causes of the contamination in Illinois, California and Massachusetts were never firmly established. The principal theory in the Illinois case is that unpasteurized, possibly contaminated, milk was able to inadvertently get into the pipes that carried pasteurized skim milk and thus contaminated the low-fat milk that was being produced. The most likely source for the contamination, investigators said, was a small length of pipe - called a cross-connection - that linked piping carrying unpasteurized milk on one side to pipes carrying pasteurized skim milk on the other. The cross-connection had been installed by the dairy some years after the plant was built.

The Chicago-area dairy produced low-fat milk by blending pasteurized whole milk with pasteurized skim milk. The process is known as post-pasteurization blending because no further pasteurization is done after the blending occurs. A number of dairies use this method of processing, and FDA has not questioned it as long as proper safety procedures are followed.

In discussing the various outbreaks, Kozak pointed out: "We did not discover any common denominators from a technology standpoint. One purpose of our latest initiative is to find out if there are any common patterns or factors that may pose a potential public health problem." The monitoring of the nation's milk and dairy products, to a great extent, is done through a memorandum of understanding between FDA and the National Conference on Interstate Milk Shipments, an organization in which all the states are represented. This primarily involves so-called Grade A dairy plant operations. Separate federal regulations and individual state requirements are employed to regulate non-Grade A dairy products, including cheese.

The basic standards that dairies

must meet in the production of Grade A milk and other dairy products are spelled out in the Pasteurized Milk Ordinance that was developed by FDA in a joint effort with the states and the industry. The ordinance's requirements form the basis of the milk safety and inspection laws of all the states.

FDA's latest initiative reflects the agency's concern about the need for more training programs for federal and state dairy investigators as well as for dairy industry personnel. Major emphasis would be on familiarizing them with the complex and changing technology used in dairy processing and of the potential for contamination of milk products after they have been pasteurized.

FDA already has completed one training program for some 40 of its investigators on dairy product safety, with emphasis on evaluating the dairy operations technology. The training sessions were held at Utah State University in Logan, one of the leading dairy science schools in the country. Another training session for some two dozen FDA milk specialists was held in February in Lexington, KY, where some of the classes were conducted in a large, modern dairy there.

The states are also encouraged to undertake their own training programs, in cooperation with FDA and industry. FDA is urging the states to be alert to modifications dairies make to their original plant designs. Such changes are common because of changing market demands for dairy products. In its memorandum, FDA notes that "major changes have been made in the dairy industry regarding the handling of milk after pasteurization and before packaging." Calling for a "comprehensive review and evaluation of critical control points and possible routes of contamination" of post-pasteurization blending operations, the memorandum adds:

"There has been a proliferation of pipelines connecting raw unpasteurized and pasteurized storage and holding tanks in dairy plants. These connecting lines present easy by-passes around the pasteurizer [the unit in

which unpasteurized milk is heat-treated to kill any harmful organisms, thus permitting post-pasteurization contamination in the event of equipment failure or operator error. The existing equipment controls and operating procedures need to be closely examined to ensure that any potential opportunities are completely eliminated."

The need for regulatory agencies to have up-to-date diagrams of dairy operations also was stressed in the FDA memorandum.

"In many cases," it pointed out, "up-to-date diagrams of all operations within the plant are not available. In addition, it is unclear whether all modifications to existing systems and renovations are being submitted to the state or local regulatory agency for evaluation as to their effect on the entire plant system. It is also unclear whether adequate plan review is being provided to assure that the design of plants incorporates no "cross-connections" between pasteurized product equipment and raw product equipment and piping..."

The agency noted that its inspections of soft cheese manufacturers after the California illness outbreaks have revealed "similar problems with respect to potential bypasses around the pasteurizer, post-pasteurization blending, and the lack of education and training [of dairy employees]." FDA said that its cheese plant inspections also had disclosed other contributing factors that were not found during its inspection of plants producing Grade A milk products. These included defects in the pasteurization process, the presence of pathogenic organisms on surfaces in the processing and storage areas, and discrepancies in pasteurization charts and other records.

FDA said dairy industry personnel also should receive more training. "The lack of awareness of dairy plant employees concerning the public health consequences of improper pasteurization or post-pasteurization contamination has sometimes contributed to conditions leading to dairy plant processing problems," the memorandum declared.

Although state and local regulatory agencies are primarily responsible for inspecting all phases of dairy operations within a state, FDA also conducts its own so-called "check ratings." In effect, FDA sends its own milk specialists to evaluate a plant and the rating that state inspectors have given it. Dairy plants must pass the state rating in order to ship products interstate.

In the memorandum, FDA also announced it would:

- Conduct more "intensified inspections" of non-Grade A dairy processing firms over the next few years.
- Obtain samples for possible pathogenic contaminants in finished products when it makes its own inspections and check ratings.
- Makes its own evaluations of key equipment, including pasteurizing equipment, pipes, cleaning and sanitizing procedures, and required records of daily operations and production.

Acknowledging that the dairy industry was deeply concerned that the outbreaks in recent years could have a negative effect on the public's confidence in the safety of milk products, several industry spokesmen have stressed - as did FDA's Kozak - that the safety record of the nation's dairies, and particularly its milk producers, was still an excellent one. But the outbreaks, industry spokesmen say, cannot be ignored.

"These were important outbreaks that caused great concern not only within the industry but outside of it," said John Adams, director of milk regulatory and animal health affairs for the National Milk Producers Federation in Washington, D.C. "We realize that we have a pretty good track record when you consider that we process an awful lot of product every day. But milk also is a very perishable product, and I would say that the attitude of industry now is - and always has been - that we must stay on guard and try to stay on top

of any potential problems."

Expressing concern over possible cutbacks by the federal and state governments in carrying out their inspectional and training activities, Adams stressed that maintaining the safety of milk and milk products required an "active force of people out there doing the job...The dairy industry cannot be held totally responsible for regulating itself. In many cases we are put in a position of having to regulate our own people, and that is not always easy.

"The public demands more than just responding to a crisis. I think what the public wants us to do is to be out there monitoring and being on top of these problems and, like these new [FDA] initiatives demonstrate, we are going to be."

Chris W. Lecos is a member of FDA's public affairs staff.

Pest Control MAGAZINE

The industry's best information source.

■ Vern Walter, noted author and authority on food sanitation, writes a monthly column, Quality Assurance, in PEST CONTROL.

The industry's best advertising environment.

■ PEST CONTROL reaches the PCO's who specialize in food sanitation problems.

For more information on subscriptions, marketing or advertising in the most respected magazine in the industry, call Group Vice President Bob Earley at (216) 243-8100 today.

*BPA Publisher's Statement, December 1985.

Pest Control
A BPA
PUBLICATION

7500 Old Oak Boulevard,
Cleveland, OH 44130 • (216) 243-8100

A HARCOURT BRACE JOVANOVICH PUBLICATION

ONLY THE BEST

Did you have time for all of your business reading in 1985? If not, **ONLY THE BEST** can help you catch up. Twenty of today's top business books are summarized and reviewed in this special edition. Each review has previously appeared in **Business Book Review**, so you can be certain of its top quality. Reviews include **Managing Corporate Culture**, **The Organized Executive**, and **Competitive Advantage**. To order a copy, simply send \$8.95 + \$1.25 shipping and handling with the order blank below. (Pre-paid orders only). Don't let this opportunity pass you by!

Please send me _____ copies of **ONLY THE BEST**. I enclose \$10.20 per copy (8.95 + \$1.25 shipping and handling).

member of IAMFES

Name _____

Title _____

Company _____

Address _____

City/State/Zip _____

Phone _____

IAMFES, Dep. L

P.O. Box 701, Ames, IA 50010

1-800-525-5223

Please circle No. 134 on your Reader Service Page

Please circle No. 110 on your Reader Service Page

Quality of Tomato Paste, Sauce, Puree and Catsup

By Lester Hankin
Connecticut Agric. Exp. Station
Box 1106
New Haven, CT 06504

A cooperative study by The Connecticut Agricultural Experiment Station, New Haven and the Food Division of the Connecticut Department of Consumer Protection, Hartford

Tomatoes are believed to have originated in tropical America and were taken from Mexico or Peru during the 16th Century to Europe where they were called "golden" or "love apples" and grown as a curiosity. During the early 1800s, tomatoes were cultivated for market in Europe, but considerable time passed before they were universally accepted as food. Although Thomas Jefferson cultivated tomatoes in 1781, they did not become popular as a vegetable in America until about 1840. Canning of tomatoes was first recorded in 1847 in Pennsylvania. (2)

Annually Americans use more than 23 pounds of processed tomatoes (exclusive of catsup and sauce) compared with 35 pounds of all other processed vegetables. (2) In dollar value, tomatoes are second to potatoes among all vegetables produced. (2) The retail value of tomato paste and sauce is \$422 million; if spaghetti sauce is included, the total value is \$1.2 billion. (4)

Section 155.191 of the Code of Federal Regulations (CFR) (1) defines standards for tomato concentrates. Tomato concentrates are prepared by concentrating one or more of the following: (i) Liquid from mature tomatoes of the red or reddish varieties (*Lycopersicum esculentum* P. Mill.). (ii) Liquid from the residue from preparing tomatoes for canning, consisting of peelings and cores, with or without tomatoes or pieces. (iii) Liquid from the residue from partial extraction of juice from tomatoes. Optional ingredients may include salt, lemon juice or organic acids, sodium bicarbonate, water, spices and flavorings.

Tomato puree or tomato pulp must contain at least 8 percent but less than 24 percent tomato solids. Tomato paste must contain at least 24 percent tomato solids. Although tomato catsup, defined in CFR section 155.194 (1), is made from any combination of tomato ingredients it may also contain optional ingredients, including spices and sweeteners. We have used the spelling "catsup", but ketchup and catchup are equally acceptable. There are no regulations for tomato sauce.

Fifty-nine samples of tomato products (16 pastes, 19 sauces, 9 purees, and 15 catsups) were collected by in-

spectors of the Connecticut Department of Consumer Protection at retail stores and examined at The Connecticut Agricultural Experiment Station for compliance with regulations and for nutrients.

Methods

Analyses were according to Official AOAC Methods (3) or methods defined in CFR 155.3. (1) Glucose and fructose were determined by gas chromatography using a method devised by V. Agarwal in this laboratory (unpublished). The percentage of total carbohydrate and calories were calculated. Calories are the % fat \times 8.79 + [(% total solids - (% fat + % ash))] \times 4. Total carbohydrate is % total solids - (% fat + % protein + % ash). Fiber was measured as crude fiber, essentially non-nutritive material.

Results and Discussion

The moisture, solids, fiber, salt, sodium, total carbohydrate, glucose, fructose, protein, fat, and calories are shown for each of the 59 samples in Table 1. As expected, both fat and protein content were low because tomatoes are not a rich source of these nutrients. All samples contained the amount of product claimed on the label. The percentages of the container filled by each type of product are shown in Table 2.

Pastes: All tomato pastes contained more than 24 percent tomato solids as required by Federal Regulations. The range was 24 to 28.6 percent; the average 25.3 percent (Table 1 and 3). Fiber averaged 2.1 percent. Salt in the pastes, including three labeled "no salt added" (Samples 1, 2, and 6), averaged 0.43 percent. Although samples with labels claiming "no salt added" averaged 0.36 percent, some samples with labels making no claim about salt were slightly lower in salt. (Table 1)

The sodium content averaged 99.6 milligrams per 100 grams; the range was from 19 to 295. (Table 3) The

Table 1. Analysis of Tomato Paste, Sauce, Puree, and Catsup.

Sample No.	Moisture, %	Solids, % (a)	Fiber, %	Salt, %	Sodium, mg/100g	Total Carbohydrates, %	Glucose, %	Fructose, %	Protein, %	Fat, %	Calories per 100g
PASTE											
1	73.5	26.8	2.1	0.37	165	18.4	5.5	5.2	3.4	0.4	90
2	73.6	25.0	2.0	0.34	125	18.2	5.7	6.5	3.6	0.3	90
3	75.1	24.0	1.8	0.31	170	18.0	6.2	6.5	3.0	0.3	86
4	74.0	25.2	2.8	0.38	19	19.8	6.2	7.9	3.3	0.4	96
5	75.1	24.0	1.8	0.31	78	19.2	6.1	7.2	3.1	0.4	93
6	73.8	25.4	2.0	0.37	50	20.1	4.3	4.9	3.1	0.5	97
7	72.7	26.6	2.8	0.76	295	20.4	5.7	7.4	3.6	0.4	100
8	74.9	24.6	3.1	0.34	67	19.3	6.2	7.3	3.3	0.4	94
9	73.8	25.7	1.8	0.45	80	16.9	4.4	6.4	4.4	0.3	88
10	73.5	25.3	2.0	0.33	140	19.1	5.4	7.7	3.0	0.3	91
11	75.2	24.4	2.7	0.46	70	18.8	6.7	7.0	3.3	0.4	96
12	72.2	28.6	2.0	0.59	145	20.2	6.6	7.9	4.4	0.3	101
13	74.1	24.5	1.7	0.41	150	18.2	5.6	7.3	3.3	0.2	88
14	76.0	24.2	2.2	0.60	115	15.5	4.0	5.0	3.5	0.3	79
15	73.8	25.6	1.8	0.45	80	16.9	4.4	6.4	4.4	0.3	88
16	75.0	24.7	1.6	0.34	140	17.8	5.4	6.8	3.4	0.3	87
SAUCE											
17	90.4	9.0	1.0	1.24	485	5.5	1.7	1.5	1.2	0.2	28
18	90.4	8.1	0.7	1.28	450	5.7	2.0	2.1	1.1	0.2	29
19	90.1	8.5	0.8	1.50	453	5.7	2.1	2.0	1.2	0.1	29
20	90.8	9.1	0.6	1.39	450	5.3	1.7	1.6	1.3	0.1	27
21	90.1	9.9	0.7	1.50	640	6.2	1.9	1.4	0.8	0.1	29
22	90.7	8.6	0.8	1.07	415	5.0	1.7	1.0	1.7	0.2	28
23	91.1	7.9	0.7	0.73	235	6.4	1.9	1.2	0.5	0.2	29
24	88.5	10.4	0.7	1.14	540	7.1	1.8	1.2	0.7	0.1	37
25	90.2	9.1	0.7	1.44	640	5.3	2.0	2.8	1.7	0.2	29
26	90.1	9.5	1.3	0.20	19	6.1	2.7	2.1	1.5	0.2	32
27	90.8	8.3	1.2	1.38	450	4.7	1.9	1.8	1.3	0.1	25
28	89.6	10.2	0.6	1.48	518	6.9	0.8	1.1	0.9	0.1	32
29	90.5	8.7	0.8	1.23	483	5.0	1.6	1.3	1.8	0.2	29
30	89.9	9.2	0.6	0.96	315	6.4	2.4	3.1	1.4	0.2	33
31	89.3	10.7	0.7	0.19	5	7.6	2.8	2.3	1.4	0.2	38
32	89.2	9.5	0.8	1.33	445	6.3	2.0	1.6	1.6	0.2	33
33	89.8	9.6	0.7	1.00	390	6.0	2.0	1.4	1.7	0.2	32
34	88.9	9.6	0.7	1.46	430	6.6	2.3	2.3	1.6	0.2	34
35	90.5	9.1	0.6	1.51	543	5.3	1.9	2.0	1.5	0.2	33
PUREE											
36	88.8	12.1	0.9	0.24	67	6.3	2.7	3.1	2.7	0.2	40
37	85.8	13.6	1.1	0.26	85	9.8	3.3	3.8	1.7	0.2	48
38	90.7	9.6	0.7	0.15	65	6.3	1.9	2.3	1.3	0.2	32
39	85.4	14.3	1.0	0.23	98	10.0	3.4	3.7	2.0	0.2	50
40	89.4	10.6	0.9	0.15	95	7.7	2.5	2.5	1.1	0.2	37
41	86.6	13.8	0.9	0.23	70	8.5	3.5	4.1	2.5	0.3	46
42	88.3	11.8	1.2	0.21	120	7.9	2.7	3.3	1.4	0.2	39
43	86.7	11.4	0.9	0.18	62	6.5	2.3	2.3	2.4	0.2	35
44	84.9	14.6	1.3	0.24	50	10.0	3.4	5.6	2.0	0.4	51
CATSUP											
45	65.1	34.9	0.7	2.98	1330	29.6	8.0	3.6	1.9	0.4	128
46	71.1	28.9	1.2	0.21	145	23.7	4.7	3.3	3.3	0.3	110
47	65.4	33.6	0.9	3.26	1290	27.5	9.0	3.5	1.7	0.5	125
48	65.4	34.6	1.0	3.08	1100	28.7	4.9	2.7	1.6	0.4	125
49	72.8	27.1	0.7	3.28	1340	21.6	5.5	1.0	1.3	0.4	200
50	70.2	29.8	0.7	3.37	1400	24.5	5.7	1.6	1.5	0.3	107
51	67.3	32.7	0.7	3.50	1280	27.3	8.7	2.9	1.1	0.3	116
52	64.9	35.1	0.8	2.93	1060	30.8	8.8	3.1	1.7	0.3	133
53	69.1	30.9	1.0	3.54	1345	23.8	7.2	8.2	2.1	0.5	108
54	66.7	33.4	1.1	3.21	1205	27.6	8.9	5.0	1.4	0.4	119
55	64.7	35.3	1.2	0.18	235	32.5	10.9	7.5	1.6	0.3	139
56	66.5	33.5	0.9	2.99	1330	27.4	8.0	3.6	1.9	0.4	121
57	62.8	37.2	0.7	2.91	1153	31.3	8.0	2.2	1.8	0.4	136
58	69.9	30.1	0.9	3.46	1400	24.0	6.9	2.0	1.6	0.4	106
59	66.9	33.1	0.9	3.20	1205	27.1	7.6	4.2	1.7	0.4	119

(a) For paste, sauce and puree, solids designates natural tomato soluble solids. For catsup, solids designates total solids.

Table 2. Average Filling of Containers of Tomato Products.

Product	Avg. % Filling of container	Range
Paste	101	97-105
Sauce	101	97-104
Puree	102	100-105
Catsup	102	100-109

lower values were for those claiming no salt added. Carbohydrates averaged about 17 percent. Only 13 percent of the carbohydrate content was accounted for by glucose and fructose. The remainder is probably some sucrose and higher polysaccharides as starch, all naturally occurring in tomatoes. Calories per 100 grams averaged 86.5.

Sauces: Percentages for sauces were generally lower than in pastes because sauces contain about 90 percent water as compared with 74 percent in pastes. (Tables 1 and 3) Sauces usually contained more optional ingredients to enhance flavor and averaged 1.2 percent salt (Table 3) and about twice the sodium of pastes. The sauce claiming "no salt added" (sample 31) contained about 0.2 percent salt. No Federal Regulations pertain to sauces.

Table 3. Averages and Ranges of Constituents of Tomato Products.

Product	No. Tested	Solids,%(a)	Salt,%(c)	Total Carbohydrates,%	Fat,%	Protein,%	Calories per 100g
Paste	16	25.3 (24.0-28.6) (b)	0.43 (0.31-0.60)	17.7 (15.5-20.2)	0.34 (0.2-0.5)	3.5 (3.0-4.4)	87 (79-101)
Sauce	19	9.2 (8.1-10.7)	1.20 (0.2-1.5)	6.0 (4.7-7.6)	0.17 (0.1-0.2)	1.3 (0.5-1.8)	31 (27-38)
Puree	9	12.4 (9.6-14.6)	0.21 (0.15-0.26)	8.1 (6.3-10.0)	0.23 (0.2-0.4)	1.9 (1.1-2.7)	42 (32-51)
Catsup	15	32.7 (27.1-37.2)	2.80 (0.2-3.5)	27.2 (21.6-31.3)	0.38 (0.3-0.5)	1.7 (1.4-3.3)	126 (106-200)

(a) For paste, sauce, and puree, solids designates percent natural tomato soluble solids. For catsup, solids designates total solids.

(b) Values for salt include those claiming no salt added.

(c) Salt values include those claiming no salt added.

Puree: The purees contained about 3 percent more water than the sauces. (Table 3) All purees contained the required minimum 8 percent tomato solids and averaged 12.4 percent, about half the maximum allowed. The salt content was about half that found in pastes. (Tables 1 and 3) Most percentages for purees were lower than for pastes because of the higher water content of purees.

Catsups: Catsup is made from a variety of tomato concentrates including liquid, peelings, and cores. Although a wide variety of optional ingredients are used as flavoring, regulations require these to be listed on the label.

Catsups were the thickest product tested, averaging only 67 percent water and fully 33 percent total solids. (Tables 1 and 3) They also averaged 2.8 percent salt, more than any other product tested. (Table 3) The two samples claiming "no salt added" (Samples 46 and 55) averaged only 0.2 percent salt. Because the salt content was high, sodium content was also high, averaging 1121 milligrams per 100 grams, over twice the average of sauces. Calories per 100 grams averaged 126, higher than all other products. The primary reason is the higher carbohydrate content and the lower water content of catsup. Carbohydrates averaged 27.2 percent, about 35 percent more than in pastes and 77 percent more than in sauce. (Table 3)

Summary

The fifty-nine tomato products - pastes, purees, sauces and catsups - collected at retail stores in Connecticut met

specifications defined in the Code of Federal Regulations. Pastes contained the most tomato solids, 25 percent; sauces contained the least, 9 percent. The average salt content varied among products from a low of 0.2 percent for purees to 2.8 percent in catsups. Products claiming "no salt added" had less than 0.4 percent salt. Fat and protein were low in all products. Catsups contained the most carbohydrates, averaging 27.2 percent. The carbohydrate content of pastes averaged 17.7 percent, sauces 6 percent and purees 8 percent. Analytical values for all products are given by brand name.

Acknowledgments

Analyses were carried out by V. Agarwal, J. Hayes, M. Illig, H. Kocaba, S. McLean and M. Pyles. Samples were collected by D. Pignataro and E. Ronan of the Food Division of the Connecticut Department of Consumer Protection.

References

- Code of Federal Regulations: Title 21, parts 100 to 169 revised to April 1, 1985. U.S. Government Printing Office, Washington, DC.
- Gould, W. A. 1983. Tomato Production, Processing and Quality Evaluation, second edition. AVI Publishing Co., Westport, CT.
- Official Methods of Analysis. 1980. 13th edition W. Horwitz, ed. Association of Official Analytical Chemists, Washington, DC.
- Sacharow, S. 1985. Spaghetti and Tomato Sauces: Why Not Aseptics? Prepared Foods 154:33-34.



Eugene L. Jack

In Memoriam

Eugene L. Jack, 86, died Thursday, March 27, at Kaiser Hospice, Sacramento, after a year-long battle with cancer.

A professor of food science and technology, emeritus, Dr. Jack joined the University of California, Davis faculty in 1937 in what was then the Division of Dairy Industry. He served as chair of that division from 1946-59, retiring from UCD in 1964.

Long considered one of the nation's leading authorities in dairy chemistry, Dr. Jack's major areas of research included the chemistry of milk fat, nutritional values of dairy products, fat fractionation and molecular distillation, properties of dry milk, and dairy technology. He was the first to show that high heat treatments before drying develop anti-oxidants in the milk which retard the development of oxidized flavor.

He was a member of the American Dairy Science Association (ADSA), the American Chemical Society, the American Oil Chemist's Society, the Institute of Food Technologists and the International Association of Milk Food & Environmental Sanitarians. In 1961 he served as president of the ADSA.

Born in 1899 in Mercer County, PA, Dr. Jack obtained his early education and started university studies. He then enlisted in the U.S. Navy during World War I. Following his discharge, he returned to the family dairy farm. Then he entered Pennsylvania State University where he received his bachelor's, master's and doctor's degrees in dairy science in 1933, 1934 and 1936, respectively.

Dr. Jack is survived by a son, James Jack, now residing in Ohio. He was preceded in death by his wife, Sue Thomas Jack in 1967. Memorial contributions can be made to the Eugene L. Jack Memorial Fund in the Department of Food Science and Technology, University of California, Davis, CA 95616. Contributions should be made payable to The

Regents of the University of California and should be sent to the department. The fund will be used to support student activities related to dairy foods.

The Bugs That Bug FDA Inspectors the Most

One thing you can say about flour beetles: They know their nutrition. When they go after stored wheat, for example, they eat only the germ portion where all the nutrients are and leave behind the kernels.

And they're clever in other ways. They have functional wings that they use judiciously, preferring not to expose themselves needlessly. They burrow down into flour so they cannot be seen and, with food particles clinging to the hair on their little (one-seventh of an inch long) bodies, look just like what they are hiding in. Even their eggs have a sticky surface that catches food particles, adding to their camouflage.

And are those beetles ever mean. If they find that a food they want is already claimed by other insects, they will drive out or destroy the homesteaders and take over the entire supply for themselves. In fact, macaroni is one of the few foods where the flour beetles' competitors can survive: Smaller insects crawl inside the tubes of pasta where the beetles are too large to pursue them.

With traits like this, it's no wonder they have survived since prehistoric times to be the most prevalent insect pest in our basic food supplies.

There are more than 150 different kinds of insects that infest food after it has been harvested, causing the loss of at least 10 percent of the world's food supply every year, usually in developing countries that can least afford such losses. Flour beetles are the most abundant and destructive of these insects and are the insects most often found by FDA inspectors in food manufacturing plants and warehouses.

Wherever they are found, flour beetles cause serious damage. They prefer to eat flour and other grain products, such as bread, noodles and cereals, but they will also devour whole grains such as wheat, oats and barley. If no grain is available, almost any dry vegetable material will do. They have been known to infest nuts, beans, dried fruits, cocoa, yeast, spices, tobacco and marijuana. They can even live and breed in the fiery and seemingly hostile environment of pure paprika.

Flour beetles even engage in chemical warfare. They give off noxious chemicals called quinones when they are disturbed or startled, to drive away predators or other competing insects.

Quinones are responsible for the characteristic

musty odor of beetle-infested flour and can even effect the taste of foods made from the flour. (The cricket-size penacate beetle of the southwestern desert, a close relative of the flour beetle, has a similar defense. It stands on its head when disturbed and emits a foul-smelling cloud that can rival a skunk's scent.)

Besides eating and spoiling food, flour beetles may also be carriers of bacteria, molds and parasites. They are an intermediate host for the dwarf tapeworm, a parasite found in rats and mice that live off beetle-infested foods. Humans can become infected with the tapeworms by unwittingly eating infected beetles hiding in contaminated food.

Because flour beetles are masters of camouflage and concealment, it is not easy to detect an infestation in food. They are shy of light and will hide under food or in cracks and crevices when a room light is switched on. And, while other insects give themselves away by the droppings (pellets) they leave behind, flour beetles provide no such clue. Their excreta is often the same color as the food they're eating. But nature did not create a perfect predator. The beetles do leave a telltale sign when they periodically shed their outer skins. These gold-colored skins stand out readily in the infested flour or other food.

A single beetle may shed its skin as many as 10 times. Such shedding is necessary for the four-stage growth from egg through larva to pupa and then adult. Shedding happens most often during the larva stage, when main growth occurs. The resting (pupa) stage - when the wormlike larva becomes an adult beetle - is the last time for shedding, or molt. One pair of adult beetles may live for two years and produce as many as 900 offspring, so it's not surprising that a large number of skins (and pellets) accumulate in infested food in a relatively short time.

To detect and measure flour beetle contamination, FDA scientists have developed several methods for separating the insects from the food they contaminate.

An insect's body shell will repel water but not petroleum solvents, such as kerosene. By mixing test

samples of infested foods, water and solvent together, the beetles become saturated with solvent and the foods with water. Then the solvent floats to the top bringing with it the beetles, to be skimmed off, identified and counted.

When whole beetles and parts aren't detected in the examined samples, FDA scientists use a blue cloth filter and special washing techniques to find and count beetle eggs. If the grain - with beetles and all - has been ground into flour, the fragments can still be identified and counted, even though they are microscopic in size. FDA scientists have photographed and cataloged all body parts of the flour beetle larva and adult to help identify beetle fragments.

Out on inspection sites, such as food warehouses and grain elevators, FDA relies on the sharp eyes and experience of its field investigators to detect flour beetle infestations. The beetles manage to hide in all kinds of places, including corrugated cardboard packing, in the gear boxes of machinery where grain is ground into flour, and even in bait set out to control rodents. An FDA inspector with an eye for beetles can recognize unsanitary practices that permit beetle infestation and will see that the problems are corrected.

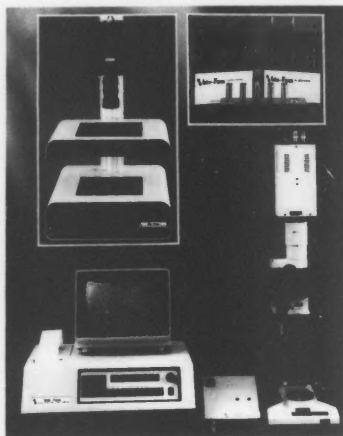
Flour, grain and other food products contaminated with beetles may not be sold for human consumption. Stored grain can sometimes be reconditioned by sifting and processing, but most often it and other contaminated foods must be converted to animal food or destroyed.

A good word for the thus-far pilloried flour beetle: For many scientists it is a valuable and useful insect. The structure of flour beetle genes is easily mapped and observed, which makes the bugs useful in genetic research. They are easy to raise in laboratory cultures and have a number of mutant genetic traits useful in cross-breeding experiments. But away from the laboratory - in the warehouses and granaries of the world - the flour beetle is seen as the dreadful little pest that it is.

Reprinted from the April, 1986 FDA Consumer.

New Product News

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



Automated Microbiology System Introduced

• Foss Food Technology Corporation now offers the Bio-Foss Automated Microbiology System which has a wide application in the food industry.

The system can be used for rapid counts of micro-organisms with results printed out in 10-20 min. depending on the type of sample. It can also be used for automatic counting of colonies on petri dishes and the automatic counting of spirally poured plates.

The Bio-Foss Automated Microbiology System is made up of five main modules:

1. Reagent system for handling reagent preparation and dispensing.
2. Filtration unit for capturing micro-organisms.
3. Epifluorescence microscope.
4. Microprocessor controlled image analyzer for automatically counting the micro-organisms.
5. Macro stand for use in colony counting and counting spirally poured plates.

After a simple pre-treatment stage (which varies with the type of sample), the micro-organisms are captured on a polycarbonate membrane and stained with a fluorescent dye. The membrane is mounted on a slide and the fluorescing bacteria are counted automatically by the image analyzer via the epifluorescence microscope.

The method is rapid, direct, and sensitive; all essential elements in advanced control over acceptance/rejection of incoming product, release of product, and monitoring of production.

Application areas include milk and dairy products, meat and meat products and beverages.

Please circle No. 253
on your Reader Service Page

Compiled Version of Ecotrac Runs Twenty Times Faster

• A newly compiled version of Ecotrac environmental data management software is now available from Solutech Corporation of Denver, Colorado. According to Solutech President, Roger Johnson, this compiled version is an update using the latest in software tools and will process information twenty times faster than previous versions.

Ecotrac is a Menu-Driven Data Base Manager designed to fit the needs of environmental managers and will run on IBM personal computers and compatible machines. Mr. Johnson said the machine language version was developed in response to customer needs for faster data processing. It will still access records from Dbase III, the language of the previous version.

Also available from Solutech is a new Ecotrac demonstration diskette containing a working version of the Ecotrac manifest tracking module, one of the eight modules that presently comprise Ecotrac. The disc demonstrates three fundamental features of Ecotrac: data editing, browsing and report generation. The demo disc is available for \$25.00.

Information on Ecotrac and the demo disc can be obtained by contacting Solutech Corporation, 11011 W. 6th Avenue, Suite 307, Denver, Colorado 80215. 303-237-1065.

Please circle No. 254
on your Reader Service Page

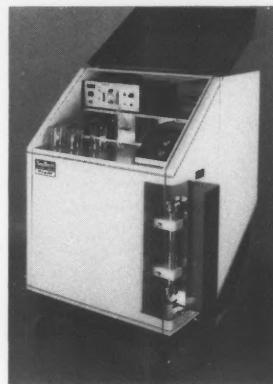
Keystone Synthetic Lubricant Lowers Maintenance And Energy Costs

• Keystone, a division of Pennwalt Corporation with approximately 600 distributorships nationwide, has announced the availability of a case history flyer which describes how a fastener maker lowered maintenance and energy costs by changing to a Keystone synthetic lubricant.

Case history #085, the latest in Keystone's Lubricant Star Performer series details how the switch to Keystone KSL-220, a synthetic, diester based lubricant, cooled off the two main plant air compressors and ended a troublesome sequence of lubrication maintenance problems including overheating, varnish deposits and vane sticking at Powerline Sales, Inc.

For more information or to obtain a free copy of this flyer, please contact: Herb Kaemer of: Keystone Industrial Lubricants, Div. of Pennwalt Corporation, 21st and Lippincott Streets, Philadelphia, PA 19132. Call TOLL-FREE 1-800-344-2241. In PA, call 1-800-662-6686.

Please circle No. 255
on your Reader Service Page



PREP HPLC Biochromatograph For Peptide/Protein Research

• The newly-released ST/LAB 300 PREP HPLC Biochromatograph is engineered for research applications involving *peptide or protein separations*. Capable of utilizing 1/2, 1, or even 2 inch I.D. columns, the ST/LAB 300 is designed for both *Semi-Prep and Prep HPLC Separations*. In addition to milligram to multi-gram separations capability, the ST/LAB 300 high pressure capability permits the use of high efficiency, wide-pore, packing medias for improved resolution. The ST/LAB 300 delivers a highly reproducible flow rate range of 7 ml to 300 ml per minute. The ST/LAB 300 teflon *double diaphragm* dual head pumping system offers *quiet, dependable performance*. There are *no piston seals* in contact with the solvent stream. Consequently, the ST/LAB 300 maximizes your productivity by minimizing your need for frequent seal replacement. For *added sample protection*, the double diaphragm sandwich design employs a vacuum innerspace connected to a pressure gauge or optional sensor. In the unlikely event that a membrane rupture occurs, the ST/LAB 300 sensor will protect the sample by automatically shutting down the instrument. The high pressure binary gradient capability of the ST/LAB 300 offers the advantage of *continuous gradient formation*. A *full flow variable U.V. detector* is featured. The ST/LAB 300 computer automation module, utilizing the IBM PC, provides *automated sample injection, gradient formation, and fraction collection*. The ST/LAB 300 is well designed for the transition from Analytical to Prep HPLC and will become a valuable research partner for the protein or peptide chemist when scaling up to Prep HPLC.

For more information contact: Separations Technology, P.O. Box 63, 2 Columbia Street, Wakefield, R.I. USA 02879. 401-789-5660. Telex 510 601 4474, EasyLink 629 30441.

Please circle No. 256
on your Reader Service Page

Guide Helps Balance Users Avoid Service Calls

• The vast majority of problems and malfunctions of electronic balances could be prevented if the user simply takes the time to become familiar with the product, treats it properly, and ensures a suitable work environment, according to a guide just issued by Ohaus Scale Corporation.

Entitled "Before Calling the Service Technician," the illustrated manual sets forth preventive maintenance and troubleshooting methods that will help balance users avoid unnecessary service calls. Guidelines cover selection of a proper location for a balance, how to avoid hostile environmental conditions, troubleshooting techniques often overlooked in manufacturers' manuals, and adjustment of span and linearity calibrations.

The pamphlet explains how to set up a surveillance program to monitor balance performance. Criteria are presented to help readers decide whether field service or factory repair is preferable if servicing of a balance should become necessary.

Ohaus Scale Corporation is a leading producer of electronic and mechanical weighing devices for industry, business, scientific research, and schools. Ohaus has manufactured world-standard balances and scales for more than 75 years.

For free copies of "Before Calling the Service Technician," contact Ohaus Scale Corp., 29 Hanover Rd., Florham Park, NY 07932. 201-377-9000.

Please circle No. 257
on your Reader Service Page

APV Gaulin Announces Homogenizer Brochure

• APV Gaulin, Inc., Everett, Massachusetts, announces the availability of a new brochure featuring their complete line of homogenizers.

APV Gaulin homogenizers can be used for virtually any emulsion or dispersion that requires an average particle size less than two micrometers. APV Gaulin homogenizers can produce particles as small as 0.1 micrometer at capacities ranging from one pint (500 ml) to 14,000 gph (52,900 lph). All sanitary models are in compliance with 3A standards.

APV Gaulin manufactures a complete line of lab-scale, pilot-plant, and production-size homogenizers for the food, biotech, and process industries, as well as high pressure pumps, colloid mills, and homo mixers.

For more information contact: Kathleen Meaney, APV Gaulin, Inc., 44 Garden Street, Everett, MA 02149. 617-387-9300.

Please circle No. 258
on your Reader Service Page

New Vacuum Belt Separator Now Available

• A VACUUM BELT separator is available for removing solids from process and wastewater streams. Designed to separate solids from liquids beyond the capability of gravity/vibration systems. Vacuum pressure assisted by gravity pulls the liquid through a fine mesh belt leaving the solids for recovery or disposal. The belt is a continuous loop that is kept clean by passing through a jet spray compartment for back-washing. Standard filter belts are available from 120-540 micron mesh size. The machine has low maintenance requirements and is simple to operate. The filter belt can be removed and refitted by one person within a few minutes.

The vacuum filter has a wide range of applications i.e., the removal of contaminants from wastewater before dumping to sewage; filtering to remove dirt, particles and debris from wash water, recirculating effluents, and food processing streams; recovery of product from process streams; and the dewatering of animal waste slurries.

Standard electric and hydraulic powered models are available.

Consult the factory for pricing and engineering sales literature. Dealer inquiries are welcomed.

For more information contact: Lux Metals Inc., 90 Ridgeway Avenue, PO Box 11534, Santa Rosa, CA 95406. 707-546-1821.

Please circle No. 259
on your Reader Service Page

1986 Guide to NIOSH, OSHA and EPA Air Sampling Standards

• An expanded and updated guide to NIOSH and OSHA air sampling standards is available from SKC Inc. In addition, this 1986 guide includes U.S. Environmental Protection Agency (EPA) air sampling standards. In most cases, NIOSH and OSHA standards deal with workplace exposure and 8-hour periods, while the outdoor environment and longer exposure periods are the subject of EPA standards.

The new guide lists over 1700 sampling procedures for gaseous and particulate hazards and the established NIOSH/OSHA procedures for sampling and analysis. It also itemizes 60 toxic organic compounds covered by EPA air sampling standards. For each chemical hazard, the appropriate collecting equipment is identified.

For a copy of the 1986 Guide to Air Sampling Standards, contact SKC Inc., R.D. 1, 395 Valley View Road, Eighty Four, PA 15330. 412-941-9701.

Please circle No. 260
on your Reader Service Page

Warranty for Induction Cap Sealers Introduced

• An extended parts and service warranty for induction cap sealers was announced by Enercon Industries Corporation. The warranty has been extended from one-year to two-years for the computer control board, the core of Enercon's system, because of its history of high reliability. In addition, Enercon's warranty provides one-year free service on all parts and labor, including service technicians' travel and lodging expenses.

Induction cap sealing provides a hermetic seal between plastic bottles and a specially constructed composite cap liner. Enercon's system is used to provide tamper evident seals in all packaging fields including food, pharmaceuticals, dairy, beverage, petroleum, and cosmetics.

Enercon's cap sealing system is available in 1, 3, and 5kW systems, to effectively seal cap liner diameters from 18-mm to 110-mm at line speeds from up to 200-feet per minute.

For more information contact: Enercon Industries Corporation, P.O. Box 773, Menomonee Falls, WI 53051.

Please circle No. 261
on your Reader Service Page

New Products From Dionex Offer Gradient Chromatography

Dionex Introduces a New Series 4000i

• Dionex Corporation announces the new Series 4000 Ion Chromatographs, the first totally MetalFree systems for gradient Ion Chromatography and HPLC. This is the perfect system for ionic and polar separations. It expands the power of Ion Chromatography (IC) by adding a gradient elution capability, and its patented chemically suppressed conductivity detector virtually eliminates problems HPLC has encountered in the analysis of polar compounds with no UV chromophores. And it can handle all routine HPLC applications as well.

The System Features a New MetalFree Quaternary Gradient Pump

The system features a new high pressure, quaternary pump necessary for gradient IC, ion exchange and ion pair HPLC. Because it is totally non-metallic, there is no worry about corrosion or metal contamination. Its state-of-the-art design eliminates pump pulsation, it is fully programmable and can be edited while it is running. One or two auxiliary valves can be programmed for automated sample injection and column switching.

For more information contact: Nancy Zellhoefer, Marketing Communications Manager, Dionex Corporation, PO Box 3603, Sunnyvale, CA 94088. 408-737-0700, telex 348347.

Please circle No. 262
on your Reader Service Page

Food Science Facts

For The Sanitarian



Dr. Robert B. Gravani
Cornell University
Ithaca, NY

Sanitation in the Food Industry

When the word "sanitation" is mentioned, people think of many different things. Often, thoughts of garbage trucks, land fills, rest rooms, plumbing and sewers come to mind. Sanitation actually means the promotion of hygiene and prevention of disease by maintaining sanitary conditions.

The goal of every employee in the food industry should be to do their part in assuring that foods are produced, processed and prepared in a clean and sanitary environment and with a minimum of contamination.

A well organized and effective sanitation program is designed to anticipate and eliminate potential hazards before they become serious problems.

There are several things that successful companies with effective sanitation programs have in common. They are:

- 1) Total management participation.
- 2) A company sanitation manual.
- 3) A good training program.
- 4) Good manufacturing practices.
- 5) Good personal hygiene.
- 6) Effective communication and personnel relations.
- 7) Proper supervision.
- 8) Good working conditions and adequate equipment.
- 9) Effective pest control programs.
- 10) Self-inspection programs.
- 11) Respect for the food being processed or prepared.

Let's look at each of these items in more detail.

Total Management Participation. Any sanitation program, no matter how well organized, will fail without the support, total commitment and involvement of top management. Everyone in the company, from the president to the first line supervisor, must recognize the importance of sanitation and convey this idea and attitude to all employees. This should be done not only in words and memos, but through example by personal involvement and participation in the program.

A Company Sanitation Manual. Uniform and standard guidelines for activities in the company are needed. A

sanitation manual is a "how-to" book which clearly indicates what is expected and how specific jobs should be done. The task or job is usually broken down into steps and written in easy-to-understand outline form. A schedule showing how often the job needs to be done is also listed. These standards should be developed for raw material handling, processing, finished product, cleaning and sanitation procedures, pest control, personal hygiene, employee facilities, warehousing and other important areas in food processing, retailing or food service establishments.

Training Programs. Many sanitation programs fall apart because there is no organized training program designed to acquaint employees with what is expected of them. A training program or continuing employee education can be used to:

- 1) Update skills and knowledge.
- 2) Provide important job information.
- 3) Improve communications.
- 4) Instill enthusiasm.
- 5) Improve motivation.

It is important to follow-up training activities to insure that everyone is using the new information in their daily responsibilities.

Good Manufacturing Practices. These practices summarize all of the correct procedures on how things should be done in a food processing establishment. Although these facts are often part of a company sanitation manual, they are also the law. During inspections, Federal and State regulatory agencies look for violations in good manufacturing practices.

Good Personal Hygiene. Good health, personal habits and work habits are very important and the facts concerning personal hygiene should be clearly understood by all who work with food. Understanding not only how people can contaminate food, but explaining WHY it is so important to practice good personal hygiene, should be a goal of every training program.

Effective Communication & Personnel Relations. Every organization needs effective communication to prosper. Lack of proper communication often results in inaccurate

messages, rumors, misunderstandings and many other problems. Communicate effectively by thinking about the message that you want to get across and then say or write it clearly and accurately. Remember - seek not only to be understood, but to understand - be a good listener!

Proper Supervision. Knowledgeable, well trained and personable supervisors are the key to an effective sanitation program. They can detect problems, correct them and provide instruction, encouragement and information to prevent them from reoccurring.

Good Working Conditions. Working in an establishment with good equipment and facilities, where everyone pitches in to do a good job in producing a high quality, safe and wholesome product is very important. Employees who feel that they are part of a championship team, will excel and go above and beyond what is normally expected.

Effective Pest Control Programs. These play a key role in a company sanitation program because insects, rodents and birds can easily enter an establishment and contaminate foods. A well organized program will try to:

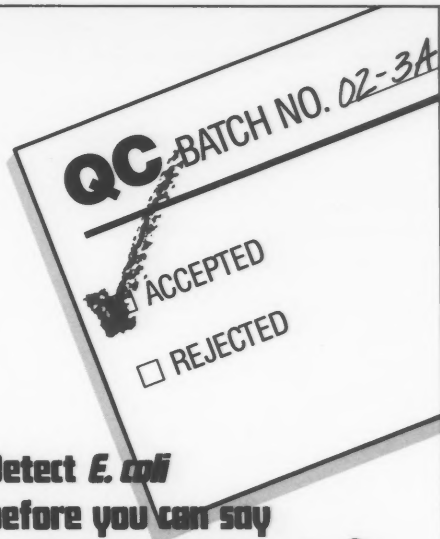
- Keep pests out,
- Remove their food and shelter, and
- Eliminate them if they enter.

An ongoing program of prevention is much easier than dealing with severe regulatory and consumer problems that result from an infestation.

Self-Inspection Program. A sanitation committee, made up of people from several departments, use a checklist of items, and carefully inspect every inch of the facility. Deficiencies that are found can be corrected by taking appropriate actions. In this way, potential hazards and problems with regulatory agencies and consumer complaints can be avoided.

Respect for Food. After working with food for a while, many employees feel that it is just an object, like bricks or lumber; they can easily forget that food is a biological system that can spoil or support the growth of harmful microorganisms that can cause illness and sometimes death. When people who work with food respect what they are working with and realize the value of it to fellow consumers, the company, their jobs and well being, everyone profits.

Someone within the company may have the title of Sanitation Director or Manager, but all employees working together as a championship team, are responsible for the production of high quality, safe and wholesome foods. Think about your job; how important is it to you, your family and the thousands of people who buy, cook and eat the product that you make every day! Isn't it worth a little extra effort to promote good sanitation?



Detect *E. coli* before you can say 4-Methylumbelliferyl- β - D-glucuronide

Well... maybe not that fast. But when traditional tests for the presence of *E. coli* often take a week or longer, Marcor's overnight MUG (4-Methylumbelliferyl- β -D-glucuronide) testing reagent seems awfully fast.

How does it work? Almost all strains of *E. coli* produce β -glucuronidase, an enzyme which hydrolyzes MUG. The result is 4-methylumbelliferone, a fluorogenic product which can be easily detected under long wave UV or 366-nm light. When MUG is incorporated into a modified MacConkey Agar or Lauryl Sulfate Broth, seeded with a single *E. coli* cell, fluorescence is usually detectable in 12 to 20 hours.

Plan now for future QC speed and economy. Perform both gas production and fluorescent tests simultaneously, and compare the results. For recommended test procedures and complete product specification, Marcor is just a phone call away.

MARCOR
DEVELOPMENT
CORPORATION

208 PARK STREET
HACKENSACK, NJ 07601
201-489-5700
TELEX 710 990 5131
MARCORDEV HAK

SALMONELLA OUTBREAK AT A FACILITY FOR THE DEVELOPMENTALLY HANDICAPPED - ONTARIO

An outbreak of *Salmonella* food poisoning occurred at the Oxford Regional Centre, a facility for the developmentally handicapped between 2 and 13 September 1984. A total of 249 persons were affected (234 of these during the first 2 days); 13 were hospitalized due to complications and 2 deaths occurred (1 of the hospitalized cases). Nine cases were dietary and counselling staff, 7 of whom gave a history of eating a Spanish cream dessert at or about the same time as the residents. The other 2 staff members ate leftover dessert on their return to work on 4 September and became ill on the following afternoon. The last case was a nurse at the Woodstock General Hospital who developed symptoms on 13 September after caring for one of the hospitalized residents.

An investigation revealed that the first 6 patients became ill between 0300 h and 0800 h on 2 September. Dietary staff at the Centre were requested to provide a food history for the residents for the 72-hour period prior to these first reports of illness. Foodhandlers who worked during that period were requested to submit stool samples for testing. It was noted that raw eggs had been used in at least 3 of the food items served at the evening meal on 1 September: Thousand Island dressing, mayonnaise and the Spanish cream dessert. Samples of these and 4 meat leftovers were also taken for laboratory analysis. *S. typhimurium* phage type 204 was isolated from 24 stool samples submitted from residents and staff, and 2 dessert samples. Phage type 49 was isolated from one hospitalized resident.

Crude attack rates and the isolation of *S. typhimurium* from the Spanish cream dessert strongly suggested this food item as the source of infection. Further investigation revealed that this dessert had been prepared on 31 August using egg-whites, yolks and a thickening agent. Raw egg whites were added to a hot mixture of egg yolks and thickening agent resulting in an incubation temperature that would have allowed the *Salmonella* organisms to rapidly multiply. Furthermore, most of the prepared dessert had been left unrefrigerated for several hours prior to serving. Therefore, poor preparation and holding procedures had been used with respect to this food item.

Discussion: This was a common-source outbreak with an explosive onset. Time of onset following consumption of the dessert is consistent with the incubation period for salmonellosis (6-72 h). *S. typhimurium* is a common serotype but phage type 204 has not been reported often. It is not clear whether phage type 49 was part of the outbreak because only one isolate was obtained (from one of the hospitalized residents).

Raw eggs have been involved in several other outbreaks. In 1981, a protein milk supplement consisting of milk, ice cream, sugar, skim milk powder, and raw eggs was suspected to have been the source of infection in an *S. enteritidis* outbreak at a home for the aged in the Kingston area. An egg-nog supplement, prepared with raw eggs was implicated in an outbreak of salmonellosis in a Scarborough nursing home in May 1982. At the beginning of August 1979, an outbreak due to *S. infantis* took place in a nursing home in the Kitchener area. Eggnog, prepared with cracked eggs, was a dietary component at the facility and was the most probable source of infection in this outbreak. An outbreak of *S. bareilly* involving 103 people took place in September 1979 in a hospital in Scarborough. It was concluded that the organisms were probably introduced into the

suspect pudding during its preparation from contaminated raw egg whites.

Economic estimates for the outbreak reported here include the following: hospitalization (13 persons for 131 days) - \$34,060; laboratory analyses - \$5,116; investigation, follow-up and legal fees at an inquest - \$10,755; loss of employee wages (10 persons for 150 days) - \$11,577 - for a total of \$61,509. These costs do not include medication, physician services and other costs of agencies and personnel involved in the 5-day inquest.

As a result of the inquest held in December, the coroner's jury made the following recommendations:

A. Recommendations Specific to the September 1984 Outbreak

1. That serving of foods containing raw eggs be discontinued.
2. That the following conditions are to be met for the handling of hazardous products requiring refrigeration:
 - a) Heavy mixtures are to be cooled in shallow pans to hasten the cooling.
 - b) Cracked eggs are to be used in thoroughly cooked products only*.
 - c) Finished products are to be stacked on racks in such a manner as to allow free circulation of cold air around the pans to hasten cooling.
 - d) Finished product is to be refrigerated at all times other than is necessary for preparation and portioning.
3. That leftover foods be discarded if not promptly refrigerated (i.e. hazardous products are not to be returned to the refrigerator for re-serving unless they have been continually refrigerated).

*This recommendation was made because cracked eggs were found in the Grade A supply at the facility. A percentage of Grade A eggs do crack in transportation and storage, and it is only to these that this recommendation refers.

B. General Recommendations for this Facility

1. That frozen meats are thawed under refrigeration or under cold running water. It would be advisable to freeze them in smaller containers to hasten the thawing process.
2. That kitchen staff be made fully aware of proper disinfecting agents for use on food preparation surfaces.
3. That all food preparation surfaces are routinely and regularly cleaned and disinfected.
4. That NO raw meat be cut in the area used for preparation of ready-to-eat foods.
5. That completely separate knives be used for cutting raw and ready-to-eat meats.
6. That gravy be stored in shallow metal containers to hasten cooling.
7. That hand soap in a dispenser be conveniently located in the butcher shop.
8. That a physical barrier (e.g. plastic sheets) be used to separate areas under construction and food preparation/storage areas.
9. That the third sink in the pot scrubbing room be repaired and/or automated mechanical pot scrubbers be provided.
10. That all badly dented or damaged utensils (e.g. dippers) be replaced.
11. That an effective fly control program be implemented.
12. That all containers of stored food be clearly marked as to their contents.
13. That employees be encouraged to thoroughly wash their hands between different operations (e.g. dishwashing to foodhandling).

14. That unclean eggs be reported to the supplier.
15. That foot-operated taps be installed at the handwashing basins in food preparation areas.
16. That the preparation of homemade mayonnaise be discontinued, or pasteurized egg products be substituted for raw eggs in the recipe.

Acknowledgments: The assistance and cooperation of the administration, medical and nursing staff at the Oxford Regional Centre and the Woodstock General Hospital are gratefully appreciated.

Can. Diseases Weekly Report 10-26-85

AN INTERNATIONAL OUTBREAK OF BOTULISM ASSOCIATED WITH A RESTAURANT IN VANCOUVER, BRITISH COLUMBIA

Two discrete clusters of cases of botulism occurred in association with one restaurant in Vancouver during the latter half of the summer of 1985. The eating establishment, the White Spot Restaurant at 1616 Georgia Street, is located near Stanley Park, a popular attraction. Eight cases have been recognized in the first cluster following a meal at this restaurant between 26 July and 2 August. A further 26 cases have been recognized in the second cluster following a meal between 29 August and 5 September. Cases have been reported in Canada, in several states in the United States, and in the Netherlands.

Type B botulinum toxin was detected in the serum of 3 patients. Seven patients have required ventilator support. There have been no fatalities. A case-control study demonstrated 2 sandwiches on the menu to be highly associated with illness, and further analysis implicated a preparation of chopped garlic in soy bean oil as the specific vehicle of intoxication. This product originated in the U.S. and was subsequently distributed in Canada. It is suspected that the product had been unrefrigerated for several months before being opened. Control measures included the voluntary withdrawal of the implicated menu items and the chopped garlic product from all White Spot Restaurants.

A notable feature of the outbreak has been the slow development and progression of symptoms, up to 10 days following exposure. Because cases were widely dispersed and initially involved atypical manifestations of acute botulism, many practitioners and specialists were misled in their primary diagnosis. Consequently many of these patients were hospitalized with a range of other neurologic and psychiatric diagnoses. It is possible that further patients with unusual neurologic illness and psychiatric diagnoses and a travel history to Vancouver within the time periods in question may yet be diagnosed retrospectively as cases of botulism associated with the outbreak. Clinicians should contact their provincial or state epidemiologist if this possibility is entertained. Cases outside of Canada or the U.S. should be reported to Dr. S. E. Acres, Bureau of Epidemiology, Laboratory Centre for Disease Control, Ottawa, Ontario, K1A 0L2, Tel.: (613) 990-8964.

Can. Disease Weekly Report 10-19-85

1984 - A RECORD YEAR FOR INFANT BOTULISM IN CALIFORNIA

A record was set for infant botulism in California in 1984;

48 hospitalized cases were recognized. Other categories of the disease's clinical spectrum (outpatient and sudden death cases) were not detected. The illness affected infants of all races (White 40%, Hispanic 38%, Asian 15%, Black 4%, Native American 2%). Thirty-three cases (67%) lived in the greater Los Angeles basin (Los Angeles, Orange, Riverside and Ventura counties), 6 (12%) in the Central Valley (Fresno, Kern, Madera, Sacramento, Solano, Yolo), and 5 (11%) in the San Francisco Bay Area (Alameda, San Mateo, Santa Clara). The other 4 cases lived in Monterey, Santa Cruz and San Diego counties. Median age at onset was 8 weeks (range 2.5 - 37 weeks). Girls (60%) were more frequently affected. Uncharacteristically, cases caused by type B-spores and toxin (54%) were more frequent than those resulting from type A (46%).

No deaths occurred among the hospitalized patients. Mean hospital stay was 32 days and ranged from 7 days at \$392/day (\$2,746 total) to 96 days at \$1,701/day (\$163,266 total). Aggregate hospital costs for the 48 cases were \$1,813,891. Fourteen infants (29%) had been fed honey before onset of illness; *Clostridium botulinum* type B was isolated from 6 of 8 honeys available for testing that had been consumed by patients. Approximately 40% of the Hispanic and Asian patients had been fed honey before onset of illness. One-third of all patients had been fed corn syrup (either light or dark or both) before onset of illness; *C. botulinum* was not isolated from 18 bottles of corn syrup that were tested. Approximately two-thirds of patients were breast-fed at birth, and almost half were still being nursed on onset. The other one-third of patients had commercial formula as their only source of milk; these infants were younger at onset (5-1/2 weeks median age) than were the breast-fed infants (10 weeks median age).

Comment: Last year's increase in infant botulism may be attributed to increased occurrence as well as to increased recognition and reporting. The geographical distribution of cases reflects the state's population distribution, but the continuing absence of cases from some regions, e.g. Calexico, Eureka, remains puzzling. A surge of incidence occurred in the first quarter of 1984, almost half of which was linked to the feeding of honey. This episode highlights the continuing need to warn parents, especially Hispanics and Asians, not to feed honey to infants nor to feed corn syrup, because the U.S. FDA has also found *C. botulinum* spores in corn syrups. The frequent recovery of type B spores from case-associated honey probably explains the unusual predominance of type B cases last year.

A recent report of 44 infant botulism cases hospitalized in Philadelphia, which noted that all were still receiving some breast-milk at onset, concluded that breast-feeding was a risk factor for illness. In California, infant botulism has affected formula-fed infants as well as breast-fed infants. The formula-fed infants were significantly younger at onset than were the breast-fed infants, suggesting an increased physiological vulnerability with formula feedings. Human milk contains secretory antibody that agglutinates *C. botulinum*, and breast-feeding may thereby prolong the onset of disease sufficiently to permit hospitalization. Because hospitalization is lengthy and expensive, investigations to identify risk factors and preventable vehicles of transmission continue.

Can. Disease Weekly Report 11-30-85

A CASE OF INFANT BOTULISM - QUEBEC

On 26 September 1985, a 3-week-old female infant was hos-

pitalized with generalized hypotonia and constipation that had gradually developed over 1 week. Examination revealed an afebrile, sleepy patient with generalized hypotonia and loss of neck muscle tone, crying weakly and having difficulty feeding.

Laboratory test results, including lumbar puncture, were normal. The thyroxine level at birth was normal; a tensilon test was negative. Upon questioning, the mother indicated that the infant was being formula-fed and had been given a pacifier sweetened with honey several times since birth.

A presumptive diagnosis of botulism was made and the infant was transferred to the intensive care unit where respiratory parameters could be monitored. An electromyogram indicated subacute to acute myositis. Stool specimens were positive for both toxin and *Clostridium botulinum* type A; no toxin was found in the serum. Preliminary analysis of the leftover honey revealed an exceptionally large number of *C. botulinum* type A spores.

The infant gradually recovered and was discharged on 25 October. Respiratory support was never required. No antibiotic or antitoxin was given.

Editorial Comment: This is the second case of infant botulism to be reported in Canada and the first one associated with honey. The first case, which occurred in October 1979, involved a 37-day-old breast-fed male infant. The source of the *C. botulinum* was not found, but it was speculated that the child had ingested the spores with dust when the family had stayed at a very dusty trailer campsite.

Can. Diseases Weekly Report 11-30-85

CRYPTOSPORIDIOSIS IN HAMILTON, ONTARIO

Cryptosporidium, an intestinal protozoan parasite, and a well-known cause of diarrhea in animals, was first noted on the gastric mucosa of asymptomatic mice in 1907. It is increasingly being recognized as a cause of infection and disease in humans.

This report presents the results of investigating the families of 7 index cases of acute cryptosporidial gastro-enteritis in the Hamilton area between May and September 1985. Six of these cases occurred in September.

A total of 29 family members were interviewed; stool analyses were available for 24. Of the 7 index cases, 4 were male and 3 were female, the average age being 3 years (range 4 months to 9 years). Each presented with diarrhea and vomiting; abdominal cramps and fever were also common symptoms. Of the 22 remaining family members, 6 were siblings and 16 were adults (including 2 grandparents and a common-law husband). Sixteen of the 22 were symptomatic during the illness period of the index cases, and had similar symptoms, i.e., diarrhea, cramps, and vomiting, but these were usually milder and of shorter duration. Only one secondary case required hospitalization, whereas 6 of the index cases were admitted. All cases to date have resolved with symptomatic care only, including a lactose-free diet. None of the patients were immune compromised.

Three of the 7 families had at least one child in nursery school or day care. Five of the families had household pets (cats 2, dogs 2, guinea pig 1, cockatiel 1). None had any farm animal exposure. One family who lived near a farm outside of Hamilton had been in Brazil when the index case first became ill.

Stool specimens for parasite examination were collected and transported in sodium acetate-formalin preservative. Twenty-

three of the 29 people had gastrointestinal symptoms. Fifteen of the people had positive stools for *Cryptosporidia* spp. oocysts. Only one asymptomatic excretor of cryptosporidial oocysts was found in this cohort. She was also excreting *Giardia lamblia*. Two children had enteroviral (coxsackie B2, ECHO 24) infections and *Cryptosporidia*, one had rotavirus and *Cryptosporidia*, one had *Dientamoeba fragilis* and *Cryptosporidia*, and one adult had *G. lamblia* alone. No bacterial pathogens were isolated from symptomatic individuals on routine culture.

Can. Diseases Weekly Report 11-30-85

TURKEY-ASSOCIATED SALMONELLOSIS AT AN ELEMENTARY SCHOOL - GEORGIA

Between May 10, and May 16, 1985, an estimated 351 children and staff at a Georgia elementary school developed febrile gastroenteritis. *Salmonella enteritidis*, sensitive to all antimicrobials tested, was isolated from more than 100 children; 23 were hospitalized; none died. The risk of illness was strongly associated with eating turkey salad with the school lunch on May 10, which was reported by 64 (91%) of 70 ill children and none of 13 well children in a case-control study ($p < 10^{-8}$). Culture of leftover refrigerated turkey salad yielded *S. enteritidis*; quantitative culture yielded 8.8×10^5 *Salmonella* per gram of salad. Each child received an estimated 56 grams of salad (5.0×10^7 *Salmonella*).

The turkey salad had been prepared by four symptomatic foodhandlers. Inspection of the kitchen did not reveal foodhandling practices or equipment malfunctions that might have contributed to the outbreak, except that after being cooked and deboned May 9, the turkey was refrigerated overnight in an 8-inch deep pan.

Reported by M. Smith, W. Fancher, R. Blumberg, MD, G. Bohan, MD, De Kalf County Health Dept., D. Smith, T. McKinley, MPH Office of Epidemiology, R. K. Sikes, DVM, State Epidemiologist, Georgia Dept. of Human Resources; Enteric Diseases Br., Div. of Bacterial Diseases, Center for Infectious Disease, CDC.

Editorial Note: In studies of non-typhoidal *Salmonella* with human volunteers, the lowest doses of organisms to cause illness varied from 1.0×10^5 to 4.5×10^7 , but the amount of *Salmonella* ingested in foodborne outbreaks is often lower. The observation of a 100% attack rate among children consuming an estimated 5.0×10^7 organisms suggests that the minimum dose required to cause illness is much lower.

Although turkey was reported as the vehicle in only 27 (7%) of 405 foodborne outbreaks of salmonellosis reported through the CDC foodborne surveillance system during 1972-1981, it was the vehicle in seven (23%) of 30 of the *Salmonella* outbreaks occurring in schools during that time. Turkey was the most common vehicle for all bacterial foodborne outbreaks in Georgia schools in 1971, usually after contamination during deboning followed by inadequate refrigeration. When a pan more than 4 inches deep is used to refrigerate a large hot mass, the center of the mass can remain above 50 degrees for over 24 hours, allowing ample growth of contaminating bacteria. Particular attention to adequate cooking and refrigeration during the upcoming holiday season can prevent turkey-associated outbreaks.

MMWR 11-22-85

Alaska

Jean Watts
City Sanitarian
Fairbanks

Arizona

Thomas Fuhrmann
United Dairymen of Arizona
Tempe

California

Phillip J. Barker
RioLinda Chemical
Sacramento

Larry S. Collar
Dairyman's Co-op
Creamery Assn.
Tulare

Michael Galas
Leprino Foods Co.
Tracy

John Mastrosimone
Knudsen Corp.
Lemoore

Jentry L. Nix
Diversey-Wyandotte
Upland

Connecticut

Peter R. Schoech
Guida-Seibert Dairy
New Britain

Satyakam Sen
Hartford Hlth. Dept.
Bristol

Illinois

Karen J. Engebretson
Illinois Dept. Public Hlth.
Rockford

Tedd H. Wittenbrink
Beatrice Dairy Products
Chicago

Indiana

Mary Dean
Jennings Cty. Board of Hlth.
Vernon

Iowa

Shane T. McDonald
Swiss Valley Farms
Dubuque

Douglas J. Wells
Wells Dairy Inc.
LeMars

Massachusetts

Marcia J. Stone
HybriVet
Wellesley

Michigan

Lisa C. Crofts
Nat'l Sanitation Foundation
Lansing

Peggy Dawn French
Oakland Cty, Hlth. Div.
Royal Oak

David L. Martin
Chippewa/LMAS Hlth. Depts.
Sault Ste. Marie

Minnesota

Dennis J. Grode
Klenzade
St. Cloud

Dike Holcombe
Marigold Foods Inc.
Zimmerman

Missouri

L. A. Skeate
Alfa-Laval Agri., Inc.
Kansas City

New York

Robert Charvat
Bisen Foods Co.
Buffalo

Richard A. Ledford
Cornell University
Ithaca

North Carolina

Susan C. Grayson
N.C. Health Service
Raleigh

North Dakota

Roger C. Cilke
1st District Hlth. Unit
Minot

Ohio

Andrew Campbell
Lancaster City Hlth. Dept.
Lancaster

William C. Hardesty
Milk Marketing, Inc.
Strongsville

C. E. Lawrence
C. E. Lawrence Co. Inc.
Cincinnati

Donald R. Martin
Montgomery Cty.
Hlth. District
Huber Heights

Tom Rotte
N.W. Health Dept.
Cincinnati

Mitch Steiner
Arrville

Oregon

Roger D. Krug
McMinnville

Pennsylvania

Gary E. German
U.S. FDA
Dallastown

South Carolina

Elizabeth M. Johnson
S.C. DHEC Bureau of Labs
Columbia

Texas

Paul D. Neill
Foremost Dairies, Inc.
Dallas

Barry H. Price, Jr.
City of Pasadena
Pasadena

Rex T. Sherry
Texas Dept. of Health
Austin

Wisconsin

Osama E. Embushra
University of Wisconsin
Madison

Kenneth Kirby
Edgerton

Daniel R. Kruszka
Beatrice Foods Ingredient Inc.
Beloit

Kathleen M. Peterson
University of Wisconsin
Madison

Michelle Schaack
Madison

Wyoming

Richard L. Worl
Teton County
Jackson

Canada

C. S. Coutts
Metro Windsor Essex
Cty. Hlth. Unit
Windsor, Ontario

Don Gauthier
DuBois Chemical
Weston, Ontario

Roger D. Gibb
British Columbia Packers Ltd.
Richmond, B.C.

New Zealand

Ms. C. L. Bates
Poultry Vet Services
Auckland

South Africa

Alex Von Holy
Wits University
Johannesburg

QUALITY USED EQUIPMENT

Homogenizers 15' - 5,000 GPH
Centrifugal / Positive Displacement Pumps
Pasteurizers / Processors / Kettles 25-1,000 Gal.
Disintegrators / Hammer Mills / Concentrate Breakers
Plate / Tubular / Swept Surface Heat Exchangers

WANTED — YOUR USED EQUIPMENT — WANTED

EQUIPMENT SPECIALISTS INC.

Please circle No. 124 on your Reader Service Page
7793 NW 32 St. Miami, Florida 33122
Telephone (305) 591-8484 TLX 263873

PARLOR & MANGER FLOORS DETERIORATING?

Hydro-Seal can solve these problems

- Hydro-Seal waterproofs, bonds and seals to a wet surface
- Hydro-Seal, an epoxy, hardens stronger than the original surface
- Hydro-Seal rapidly cures to a smooth yet non-skid surface
- Hydro-Seal is impervious to all acids, including Lactic
- Hydro-Seal permits easy cleaning
- Hydro-Seal permanently seals concrete, wood, tile & steel
- Hydro-Seal can be mixed with sand for permanent patching of holes and pitted areas.

For more information write or call collect

A.G. Chemicals, Inc.
215 East 79th St.
New York, NY 10021
212-249-0444

Please circle No. 104 on your Reader Service Page

High Quality Water System Disinfection, Andrew J. Streifel, MPH, Hospital Environmentalist, University of Minnesota, Boynton Health Service, Room W-140, 410 Church Street S.E., Minneapolis, MN 55455

Since 1972 we have monitored the bacteriological quality of a kidney dialysis water treatment system (DWTS) at the University Hospitals. Municipal water (MW) is pretreated then processed by a reverse osmosis (RO) device which distributes water through glass piping to the dialysis machines. Water samples are processed according to standard methods using membrane (.45 μ) techniques. Samples are incubated at 35°C and scored at 72 hours. Utilization of continuous disinfection using MW chloramines (3ppm) for the DWTS and heat disinfection of the dialysis equipment maintained water bacteria levels at <10cfu/ml from 1975-1982. RO membrane degeneration due to pH and toxicity of chloramines to red blood cells prompted a change to a chlorine sensitive pH tolerant (3-11) thin film composite RO membrane. A UV light was substituted for chloramines as a disinfectant. A 4% solution of formaldehyde (HCHO) was used for disinfection. The noxious quality of HCHO proved unsatisfactory. A dilution of stabilized 4.5% peracetic acid (PA) at 700ppm was used in the WDS while 4% HCHO was used for the RO. Thus far PA demonstrates effective reduction of bacteria in the WDS. However, the RO machine is inadequately disinfected when using the 4% HCHO. The RO recontaminates the distribution system when rinsed. Usage of PA for the cleaning and disinfection of RO equipment and WDS is a promising relatively non-toxic substitute for certain water treatment systems.

Use of Temperature Sensitive Gel for Concentration of Bacteria of Milk, S. Maheshkumar, Richard Peterson and Sagar M. Goyal, Department of Veterinary Diagnostic Investigation, University of Minnesota, St. Paul, Minnesota 55108.

Infection and disease have been associated with milk for many years. Raw unpasteurized milk, both certified and uncertified, has been found to be contaminated with human pathogenic bacteria such as *Salmonella*, *Yersinia*, *Listeria*, *Campylobacter* and pathogenic strains of *Escherichia coli*. Small numbers of these bacteria can remain undetected in standard bacteriological tests of milk. The present study was undertaken to determine if a temperature-sensitive gel (made from isopropylacrylamide) could be used for concentration and detection of bacteria from milk. This gel swells at 4°C, collapses at higher temperatures (ca. 50°C), and absorbs water and small sized solutes while rejecting larger molecules such as bacteria and viruses. Using *Escherichia coli* as a test organism and temperature-sensitive gel, a ten fold reduction in milk volume was achieved with the recovery of the test organism ranging between 35 and 45 percent. A pH of 5.5 was found to be optimal for concentration of bacteria from milk. This procedure is simple and easy to perform and is inexpensive because the gel is reusable.

Detection of Gram Negative Bacteria in Cottage Cheese by an Impedance Technique, Nora Tsang*, Ruth Firstenberg-Eden and Joseph Zindulis, Bactomatic, Inc., P.O. Box 3103, Princeton, NJ 08540

Gram negative (-) bacterial contamination is a leading cause of spoilage in cottage cheese. These contaminants, due to their low initial number, cannot be effectively counted by standard plate count method. Visual interference of the product in agar plates and the presence of active Gram positive (+) starter cultures in high numbers further complicates the problem. An impedance test was developed to detect Gram (-) contamination in cottage cheese. Two selective media, crystal violet deoxycholate broth (CDB) and modified crystal violet deoxycholate agar (MCDA), were formulated for this method. In the test procedure, one half of a container of cottage cheese was removed and replaced by the CDB to produce a 1:1 mixture. This mixture was pre-incubated at 21°C for 18h. 0.1 ml of the preincubated sample was then inoculated onto 0.5 ml of MCDA. The impedance was monitored at 21°C for 24 h. This test can detect the presence of <10 CFU/g of Gram (-) bacteria within 30 h. Samples with Gram (+) starter cultures at levels $\leq 10^5$ CFU/g were successfully inhibited and did not interfere with the detection of Gram (-) bacteria. Since the plate count method cannot accurately enumerate <10² CFU/g of Gram (-), the impedance detection times were correlated to the Gram (-) bacterial concentration after preincubation, yielding a correlation coefficient of 0.93. This method is unique in its ability to detect levels of <<10 Gram (-) bacteria/g regardless of the level of Gram (+).

Quantitation of Growth of Mold on Cheese, Ahmed E. Yousef* and Elmer H. Marth, Department of Food Science and The Food Research Institute, University of Wisconsin-Madison, WI 53706

This study was based on the fact that mold grows radially at a constant rate on solid media. Natural cheeses were sliced under aseptic conditions, and slices were placed in sterile petri plates. A spore suspension of mold was inoculated at the center of the cheese slice and plates were covered. The radius of the mold colony was monitored, and the rate of radial growth was calculated by regression analysis. Cheeses tested were mild Cheddar, aged Cheddar, aged smoked Cheddar and brick. Molds grown on cheese were *Aspergillus parasiticus* or *Penicillium camemberti* (*caseicola*). Results indicate that aged Cheddar was the most inhibitory to growth of mold, whereas brick cheese was the least inhibitory. *A. parasiticus* generally grew faster on cheeses than did *P. camemberti*. Another experiment was done wherein process rather than natural cheese was tested. Generally molds grew slower on process cheese than on natural cheeses. Several concentrations of sorbic acid were added to cheese during processing. Results indicate that delay in germination of spores and rate of radial growth were functions of the concentration of sorbate.

**Visit
Minnesota
in
86!**

**Hotel Reservation Form
1986 IAMFES Annual Meeting
August 3-7, 1986**

We in Minnesota extend a warm invitation to you to attend the 73rd Annual Meeting of IAMFES, August 3-7, 1986 at the Radisson Hotel South, Minneapolis, Minnesota. Besides the stimulation of the educational portion of the program, there will be many other things to do including a trip to the Minnesota Zoo followed by a pig roast.

MAIL THIS FORM DIRECTLY TO THE

**RADISSON SOUTH
7800 Normandale Blvd.
Minneapolis, MN 55435**

Name(s) _____

EMPLOYER _____

ADDRESS _____

CITY _____ STATE/PROVINCE _____ COUNTRY _____ ZIP _____

PHONE NUMBER _____

SHARING ROOM WITH _____ NUMBER OF PERSONS _____

ARRIVAL _____ DEPARTURE _____

SPECIAL REQUESTS _____

Accommodations will only be confirmed with a check for the first night's deposit. Or use your credit card to guarantee your reservation. You will be charged for the first night if reservations are not canceled prior to 6 pm.

Credit Card # _____

Type of Credit Card _____

Expiration Date _____

Cardholder's signature _____

RESERVE ROOMS PRIOR TO JULY 1, 1986 to ASSURE SPACE

**ROOM RATES \$63 plus tax (9%)
up to four persons in a room**

**QUESTIONS? Call the Radisson South at 800-228-9822
Telex # 484314**

Meeting Registration Form

1986 IAMFES Annual Meeting

August 3-7, 1986

NAME _____ COMPANION _____

EMPLOYER _____

ADDRESS _____ PHONE # _____

CITY _____ STATE/PROVINCE _____ COUNTRY _____ ZIP _____

Please check where applicable

Affiliate Delegate _____ Speaker _____
 Affiliate Member _____ 30 year member _____
 IAMFES Member _____ 50 year member _____
 Past President _____ Non Member _____
 Executive Board _____ Student _____
 Exhibitor _____ Honorary Member _____

Certificates of Attendance will be available this year. Contact Registration Desk, Wednesday August 6, 1986.

ADVANCE REGISTRATION (note, all prices at the door are at least 20% higher)
 Advance register before July 1 and SAVE. Refundable if canceled prior to June 30, 1986.

	Member	Companion(s) Each	Student	Non Member
Registration	___\$30	___\$10	___Free	___\$40
Early Bird Reception*	___Free	___Free	___Free	___Free
Zoo and Pig Roast	___\$19	___\$19**	___\$19	___\$19
Banquet and Reception	___\$20	___\$20	___\$20	___\$20
*National Mastitis Council	___Free	___Free	___Free	___Free

*Indicate attendance

**Children 16 and under \$5 each. No. _____

SPECIAL EVENTS
 choose the special events you wish to attend and include with your registration

An information booth will be available to assist you in your recreational plannings of Minneapolis sites.

Tuesday, August 5 — 9:30 a.m. to 3:30 p.m.

Comprehensive tour of the Twin Cities including such attractions as Guthrie Theater, St. Paul's Cathedral, St. Anthony Falls, Landmark Center, Minneapolis lakes and much more. Also included is lunch at Forepaughs, a haunted Victorian Mansion. Cost (including lunch) \$26/person. (Min. of 30 people)

Wednesday, August 6 — 9:30 a.m. to 2:30 p.m.

Minibus service to Southdale Shopping Center. Transportation provided free.

Monday, August 4

9:30 a.m. to 2:30 p.m.

Guided tour of Ard Godfrey House, Lady of Lourdes Church, shopping and browsing at redeveloped riverfront area. Lunch - own expense. Cost \$11/person. (Min. of 30 people)

Tuesday, August 5 — 9:00 a.m. to 4:00 p.m.

Spend a fun-filled day at Valley Fair, an outdoor entertainment center featuring carnival rides, games, exhibits, etc. Included in price is admission, transportation, lunch, Day Tours Hostess/Guide and an adult escort. (No one under 10 unless accompanied by an adult) Cost \$20/person (Min. of 30 people)

MAIL TODAY TO:
 Dr. David Smith
 Registration Chairman
 %MSA
 PO Box 13694
 Roseville, MN 55113

U.S. Funds only
 Make check or money order payable to:
 IAMFES 1986 Meeting Fund


Ard Godfrey House _____ at \$11 = _____
 Tour of Twin Cities _____ at \$26 = _____
 Valley Fair _____ at \$20 = _____
 Shopping _____
 Registration Total from above _____

Grand Total \$ _____

Equipment / Supplies

- 1- 5000 gal. cold wall tank
- 1- lot of 1" - 4" pipe valves & fittings
- 1- 500 gal. complete H T S T w homo
- 2- 6000 gal. milk storage tanks
- 2- 600 gal. processing vats
- 1- 1000 gal. conventional starter vat
- 1- 3500 Damrow deep make vat
- 1- 1000 Gal. pressure wall vat
- 1- 6000 Gal. cold wall tank
- 1- 10,000 gal. rectangular cold wall tank

Midwest Food Supply Co.



504 Clay St., Waterloo, IA 50704
(319) 234-5554

CHERRY BURRELL H-75
S/N 658 Recently Rebuilt
Half-Gallon Filler, Good Condition

DORAN SLIDE CASER
S/N 1003-1983 Model DSC PP S HG9
Spare Parts/Manual

WEST LYNN CREAMERY
626 Lynnway
Lynn, MA 01905
Att: Chris Scangas
617/599-1300 x245

Will Package Under Your Label
Ice Cream and Aerosol Whipped Cream.
Contact: **Carole Hobson**



Howard Johnson's
180 Old Colony Avenue
Wollaston, MA 02170
(617) 847-2387

Attention:

BREDDO HIGH SPEED BLENDERS

Available in All Sizes From:
25 gallons through 300 gallons

CHOOSE FROM

Complete Inventory Including
Single Wall or Jacketed Units

Contact: **BREDDO LIKWIFIERS**
18th & Kansas
Kansas City, KS 66105
800-255-4092

1971 FORD TANDEM

Hackney ice cream body. 22 foot. Lift gate across back. Refrigeration plates in ceiling. Electric plug-in. 3 H.P. compressor. Truck also has over the road generator.

DAIRY RICH ICE CREAM CO.
6510 Broadway
Merrillville, IN 46410
Phone: (219) 980-0800
Ask for Paul



SELECT ITEMS- IN STOCK

- S.S. Jet Type COP Circulating Tanks
- Assorted S.S. Wash Tanks
- CIP Systems
- Tank Truck Washers
- S.S. Work Tables, Carts and Sinks
- Mixing Units/Hose Stations for Clean-up

HERITAGE EQUIPMENT COMPANY
3200 Valleyview Drive
Columbus, Ohio 43204 (614)276-0187
Surrounding States Wats 1-800-282-7961
Ohio Only 1-800-282-2997

- 20,000 gallon silo
- (7)-4,000 gallon tanks with stainless steel heads
- CS & CP & York Heat Exchangers
- Kettles, Agitators 600 gallons & smaller
- CB Rotary Filler with 10 spouts
- CB-680 Filler
- Fittings up to 4" valves

CARMEL EQUIPMENT

246 Beacon Ave. • Jersey City, NJ 07306
(201) 656-4030

PERRY...THE DAIRY PROFESSIONALS

- Nimco 550 S.S. 1/2 p. to 1/4 gal.
- Nimco 5110 E S.S. Eco Pack
- Heaton model 340, 74 OU
- Americo 3 1 autoplate freezer, 800 GPH
- DeLevel SS Mdl. A 10-RCF plate exch., unused
- Exoello Q-80 S.S. 1/2 p. to qts.
- FMC Mdl. SSE & B-75 juice finishers
- Unifloy 350R2 blow molder, 4WD, 1 gal.
- Hartig H-140 blow molder, 1985
- 500 Gal. Groen Kettle, dbl. mot. scraper, 316SS

WE TURN YOUR IDLE ASSETS INTO CASH!

PERRY EQUIPMENT CO. INC.

Box DF. Hainesport, N.J. 08036
Phone: 609-267-1600

SELECT used machinery

DAIRY EQUIPMENT NEEDED

M & E will purchase your used equipment, either complete plants or individual items

We are THE Liquidators
and

We Come With CASH
Call Don Rieschel

MACHINERY & EQUIPMENT CO.
PO BOX 7632-W SAN FRANCISCO, CA 94120
TOLL FREE: National 800-227-4544
California 800-792-2975
Local & International 415-467-3400
Telex 340-212



Stainless Steel Single Shell Powder Hopper
APP: 8000 GAL Price \$7500

Girton 100 Gal. Dome Top Pressure Wall Pasteurizer
Waukesha 55 & 125 Positive Pumps
Damrow #5000 Fine Saver \$5000

Eaton Equipment

P.O. Box 55 BOSCOBEL, WI 53805
HIGHWAY 133 • EAST OF THE AIRPORT

DON EATON

608-375-2256

Equipment / Supplies

DISTRIBUTORS WANTED: Be first in your region to sell the Ultimate Concentrate — **COBRA, FX400, THUNDER-SUPER CONCENTRATE CLEANERS** Profits!! Packaged in pint bottles and 5-gallon pail. No more handling of 55-gallon drums. We want only the best distributors nationwide for our high technology product. Write: Despo Chemical International, Inc., 395 Front St., Perth Amboy, NJ 08861, or call (201) 826-0100.

JILCO EQUIPMENT

Cranbury N.J.
Sales—Leasing

DAIRY REEFERS
Milk and Ice Cream
New or Reconditioned
ThermoKing Diesels or D/E
Tank Floors
Our Specialty
609/655-5001

Services / Products

WE'RE IN THE MIDDLE OF THE NEW YORK MARKET

We are experienced packers of Syrups, Juices and Juice Drinks and many liquid products. Glass or Plastic Bottles. Long or Short Runs.

(201) FOOD PACKING, INC.
1501 Park Ave., Linden, N.J. 07036
(201) 925-8890




STERILE SAMPLE VIAL

One piece 45 ml vial, easy one hand handling, durable, resists cracking, food grade polypropylene.

Phone: 518-853-3377
For samples call or write:

Capitol Vial Corp.
P.O. Box 611
Fonda, NY 12068

Services / Products



Peterson Fiberglass Laminates, Inc.

The Original Fiberglass Brine Tank People
Serving the Cheese Industry since 1957

300 Stariha Drive
Shell Lake, WI 54871
(715) 468-2306

Guaranteed Heavy Duty
— fiberglass —
FLOORS, WALLS
and **TANK LININGS**

Our installed systems feature: nonslip floors; smooth seamless walls; high chemical, corrosion and impact resistance; fast set up and exceptional sanitation qualities.

- *USDA approval, all insurance coverage*
- *Professional installations since 1962*
- *Our fiberglass installations cost less and they are constructed to stay that way*
- *We try to do more for your bottom line*

M&W Protective Coating Co.
912 Nunn Ave. • Rice Lake, WI 54868
Ph. (715) 234-7894

STUDY DAIRY SCIENCE AT HOME

The Lawrence Practical Dairy Science Correspondence course teaches basic dairy microbiology, chemistry, math, etc. needed for plant operation.

Write for Brochure:
C.E. (DOC) LAWRENCE
C.E. LAWRENCE CO., INC.
phone: 513-271-8956
P.O. Box 43213
Cincinnati, OH 45243

COMPLETE LABORATORY SERVICES

Ingman Labs, Inc.
2945-34th Avenue South
Minneapolis, MN 55406
612-724-0121

Employee Training Materials
for Food Plants



- GMP booklets and slides in English and Spanish
- Sanitation booklets and slides

LJB, INC.
Associated with L.J. Bianco & Associates
Food Quality Control & Assurance Consultants
850 Huckleberry Lane
Northbrook, IL 60062
312-272-4944
35 Years Food Operation Experience

COMPONENT SAMPLES FOR CALIBRATION OF INFRARED TESTERS

Samples are also designed to be used as daily performance checks.*

1 set of 12 in duplicate	\$60.00
Add. sets same week/same address	\$30.00
Skim sample	\$ 5.00

*1 set equals 2 calibration or 4 daily checks
Call for more information (612) 484-7269
DAIRY QUALITY CONTROL INSTITUTE, INC.
2353 No. Rice St., St. Paul MN 55113

Employment Opportunities

ATTENTION: DAIRY PROFESSIONALS

Dunhill of Southeast Fort Worth, Inc. has over 40 job openings in all areas of the dairy profession. Company paid fees, relocation and interview expenses. You may qualify. Examples:

ASST. PLANT ENGR. - ICE CREAM	NORTHEAST	to \$30K
D. C. SUPERVISOR	SOUTH	to \$25K
PLANT MGR. - FLUID	SOUTHWEST	to \$40K
D. C. SUPERVISOR	MIDWEST	to \$35K
PLANT MGR. - ICE CREAM	SOUTH	to \$45K
FOOD TECHNOLOGIST	SOUTHEAST	to \$20K
D. C. MANAGER	MIDWEST	to \$45K
FOOD SCIENTIST	NORTHEAST	to \$45K
D. A. TECHNOLOGIST	SOUTHWEST	to \$25K
D. A. TECHNOLOGIST	EAST	to \$25K
D. C. MANAGER	SOUTH	to \$35K
SHIFT SUPERVISOR - FLUID	NEW ENGLAND	to \$25K
D. C. TECHNOLOGIST	SOUTHWEST	to \$25K
D. C. SUPERVISOR	NORTHEAST	to \$35K

Send resume in confidence to:

Mr. Dana S. Oliver, President

The National Personnel System

Dunhill.

PERSONNEL SERVICE OF SOUTHWEST FT. WORTH, INC.

P.O. Box 6397
Fort Worth, Texas 76115-0397
or call 817/926-7284

W CONSIDERING A NEW POSITION?

Now that you have decided to look for a better opportunity, contact Whittaker first!

QC/QA Supervisor	25-35K
IC/QC Manager	25-30K
Sanitarian	25-35K
Technical Manager	45K
Beverage Technologist PhD	50-55K
Sanitation Supervisors	25-29K
Director of QC	30K
Lab Techs	20-24K
Regional Sales Managers - Cleaners	
	30K + C + B
Regional Sales Managers - Stabilizers	
	30K + C + B
QC/R and D Manager	30-40K

Call or Write
Arnold Whittaker
or
John McCauslan

WHITTAKER & ASSOCIATES
2675 Cumberland Pkwy., Suite 263
Atlanta, Georgia 30339, Phone: 404-434-3779



TOM SLOAN

& ASSOCIATES, INC.
LICENSED EMPLOYMENT AGENCY

OUR FUNCTION IS YOUR FUTURE

ALL FEES ARE COMPANY PAID

Contact Tom Sloan

Call or send resume to:

727 Lafayette St., Watertown, WI 53094
Telephone 1-414-261-8890

Consulting Services

HARRY HAVERLAND, MPH.



GHK ASSOCIATES

Food Sanitation and Public Health
National and International
Trainers and Consultants

12013 CANTRELL DR.
CINCINNATI, OH 45246
PHONE: 513/851-1810

Equipment Wanted



WANTED

HASKON 340-U

State:

serial no.,
condition,
and when last used.

D. B. EVANS, PRESIDENT

GOLD MEDAL
PRODUCTS COMPANY,
2001 Dalton Ave.
Cincinnati, OHIO, 45214

Phone 513-381-1313

GOLD MEDAL PRODUCTS

DR. R. H. ELLINGER & ASSOCIATES

Consultants to Food Industry — Domestic — International

Research & Development

- Consumer Products
- Foodservice Products
- New Formulations
- Product Improvement
- Consumer Testing
- Experience in:
 - frozen foods
 - bakery products
 - prepared mixes
 - dairy products
 - sauces & dressings

R. H. Ellinger, Ph.D.
(312) 272-6376

Regulatory Compliance

- Legal Assistance Available
 - through Associate
 - expert food law attorney
- Labeling Compliance
- Food Safety Regulations
- Product Recalls/Seizures
- Adverse Inspections
- Port-of-entry Detentions
- Regulatory Negotiations
 - FDA, USDA, US Customs
 - State, Local agencies

Quality Assurance

- USDA Approval
- QA Audits
- Statistical QC
- Computerized QC Data
- Expert Court Witness
- Approved Procedures for:
 - HACCP
 - GMP/plant/warehouse
 - consumer complaints
 - sanitation
 - pest control

3946 Dundee Road
Northbrook, IL 60062

Abstracts of papers in the June Journal of Food Protection

To receive the Journal of Food Protection in its entirety each month call 1-800-525-5223, ext. A or 515-232-6699, ext. A in Iowa.

An Orange-Reddish Pigmentation in Roquefort Cheese, Graciela Font de Valdez, Graciela Savoy de Giori, Aida Pesce de Ruiz Holgado and Guillermo Oliver, Centre de Referencia para Lactobacilos (CERELA), Chacabuco 145, 400 Tucumán, Argentina and Facultad de Bioquímica, Química y Farmacia, Universidad Nacional de Tucumán, Tucumán, Argentina

J. Food Prot. 49:412-416

The presence of an anomalous orange-reddish coloration in Roquefort cheese during its ripening period was studied. No pigmented colonies were isolated from milk, curd, or cheeses after pressing, but their presence in relatively large numbers was observed after salting (7 d) up to the end of the ripening process (90 d). About 37% of the strains isolated (32 in all) were orange-pigment producers in light as well as in the dark (type I), whereas about 25% produced an orange coloration only in the light (type II). No production of pigment was observed at pH 6.0 or below in the absence of sodium chloride, and the highest color intensity was registered at pH 7.0 in the presence of sodium chloride. Morphological and physiologic studies of the orange-pigmented strains revealed that most of them were closely related to *Brevibacterium linens*.

Quality of Dry-Cured Hams Produced from Pre-Frozen Hams as Affected by Mechanical Tenderization and Vacuum Packaging, J. D. Kemp, B. E. Langlois, J. D. Fox and F. Nicastro, Department of Animal Sciences, Food Science Section, University of Kentucky, Lexington, Kentucky 40546-0215

J. Food Prot. 49:417-420

Fifty frozen hams were thawed for 3 d at 2-3°C, skinned and partially defatted. Half the hams were passed twice through a Ross Industries needle tenderizer and half were not tenderized. All hams were dry-cured for 16 d with a mixture of salt, sugar, sodium nitrate and sodium nitrite. Cores of 2.54-cm diameter were obtained from the cushion of 5 hams from each group weekly for 5 weeks. Outer, middle and inner portions of the cores were analyzed for salt and nitrite. After curing, all hams were held at 13°C for 14 or 15 d for salt equalization. The intact hams were smoked and aged at 24°C until a yield of 82% or less was achieved. Half the hams in each group were then placed in vacuum bags and half were left uncovered. All were aged 4 additional weeks at 24°C. Hams were cut and examined visually, by a palatability panel, by shearing and by analyzing a center slice for moisture, salt and nitrite. Tenderization allowed faster salt and nitrite absorption but resulted in slightly lower flavor and overall satisfaction scores. Tenderized hams achieved the required 18% weight loss (82%) approximately 10 d sooner than non-tenderized hams. Vacuum packaged hams had higher final yields and contained a higher level

of moisture and lower level of salt than non-vacuum packaged hams. Shear values in semitendinosus muscles were greater for tenderized than for nontenderized hams while shear values in biceps femoris muscles were higher in non-vacuum packaged than in the vacuum packaged hams. Aerobic and yeast and mold counts were higher while lactobacillus counts were lower in non-tenderized than in tenderized hams. Aerobic and lactobacillus counts were higher in vacuum packaged than in non-vacuum packaged hams. In general, tenderization allowed faster curing and aging while final aging in vacuum bags allowed higher yields.

A Simple Method for Estimating the Extent of Surface Crystal Development on Colored Cheddar Cheese, Stephen T. Dybing, Steven A. Brudvig, James A. Wiegand and Emil A. Huang, Cheese Research Group, Research and Development, Land O'Lakes, Inc., P.O. Box 116, Minneapolis, Minnesota 55440-0116

J. Food Prot. 49:421-422

A simple, non-destructive method for estimating the extent of crystal development as white specks on the surface of colored Cheddar cheese is described. This method involves photocopying the surface of the cheese with a photocopier set at an exposure calibrated to clearly show the crystals. The photocopies of the cheese surface are then compared to a series of photocopies showing designated increases in crystal growth. Crystal development was rated as follows: 0=no crystals, 1=light, 2=medium, 3=heavy, and 4=very heavy to encrusted crystal development. The method does not disrupt or destroy the environmental conditions existing in the cheese package, allowing extended shelf life studies to be done on the same piece of cheese. However, the photocopy technique may not work as well with white cheese or cheeses without flat surfaces.

Effect of Salt Concentration and Incubation Temperature on Formation of Histamine, Phenethylamine, Tryptamine and Tyramine During Miso Fermentation, K.-D. Henry Chin and P. E. Koehler, Department of Food Science, University of Georgia, Athens, Georgia 30602

J. Food Prot. 49:423-427

Two factors, salt concentration and incubation temperature, were examined for their effect on the formation of histamine, phenethylamine, tryptamine and tyramine during miso (soybean paste) fermentation. Misos containing 5 and 10% NaCl were prepared and incubated at 25 and 35°C. The effect of each factor was determined from the chemical and microbiological changes in the misos during fermentation. Salt level was a significant factor in the formation of amines. Higher amine levels were found in low-salt (5% NaCl) formulations than in high-salt (10% NaCl) misos. Incubation temperature within the range of 25 to 35°C during fermentation had little effect on amine formation in misos.

Staphylococcus aureus Growth and Thermostable Nuclease and Enterotoxin Production in Canned Salmon and Sardines, A. K. Stersky, R. Szabo, E. C. D. Todd, C. Thacker, N. Dickie and M. Akhtar, Microbiology Research Division, Food Directorate, Health Protection Branch, Health and Welfare Canada, Ottawa, Ontario, Canada K1A 0L2

J. Food Prot. 49:428-435

Staphylococcus aureus growth, thermostable nuclease (TNase) and enterotoxin production in inoculated canned salmon incubated at $22 \pm 1^\circ\text{C}$ for 4 d were dependent on the size of inoculum, and on the amount of oxygen present in the headspace; under nitrogen with an inoculum of 7 cfu/can, 10^2 - 10^3 cfu/g, no TNase and traces of enterotoxins (A, B, C₂) were observed; under oxygen with the same inoculum $\geq 10^9$ cfu/g, ≥ 6.0 μg TNase and up to 5.2 μg total enterotoxins (A, B, and C₂)/100 g of salmon were observed. Values were intermediate under atmospheric air. After 1 week, 2 months and 4-24 months of incubation of salmon under nitrogen, *S. aureus* cfus were 10^8 , 10^6 and 10^4 - 10^5 per g; TNase ranged from trace amounts to 20 $\mu\text{g}/100$ g and total enterotoxins from <1.0 μg to 6.2 $\mu\text{g}/100$ g. In canned sardines stored from 1 d to 12 months at $22 \pm 1^\circ\text{C}$, levels were 10^9 cfu/g and 3.7-3.9 μg total enterotoxins/100 g; after 1 week, counts declined to 10^5 cfu/g but total enterotoxins remained relatively stable in some cans with up to 6.2 $\mu\text{g}/100$ g of sardines after 12 months. TNase varied from <1.0 μg to 20 $\mu\text{g}/100$ g of salmon with 10^9 and 10^5 cfu/g, respectively. In sardines, similar variation in TNase was observed and there was no correlation between TNase, enterotoxins and cfu/g. After 2 d to 24 months, carbon dioxide, an acidic smell and unacceptable odors were detectable over the headspace of *S. aureus* contaminated salmon and sardines, but not all persons who sniffed the contaminated products could recognize off-odors that would warn them against consuming the food. To prevent canned foods from causing staphylococcal illness, the conditions allowing post-process contamination should be eliminated by the producer and distributor of the products.

Use of a Disc-Assay System to Detect Oxytetracycline Residues in Honey, Lawrence A. Roth, Suet Kwan and Peter Sporns, Food Laboratory Services Branch, Alberta Agriculture, O.S. Longman Building, Edmonton, Alberta, Canada T6H 4P2 and Department of Food Science, University of Edmonton, Alberta, Canada T6K 2P5

J. Food Prot. 49:436-441

A simple inexpensive disc-assay system for detection of oxytetracycline (OTC) in honey was developed. This bioassay involved diluting honey 1:1 (wt/wt) with 0.1 M phosphate buffer, pH 7.0, and applying 90 μl of this solution to a 0.5-in (12.7-mm) filter paper disc placed on *Bacillus cereus*-inoculated media. This test detected about 0.2 μg OTC/ml (0.4 μg OTC/g honey) without interference from natural antibacterial inhibitors in honey. It was also shown that a variety of materials contributed to the natural inhibitor effect in honey, including materials other than glucose oxidase-derived hydrogen peroxide and the osmotic effects of sugar.

Evaluation of the Enteropathogenicity of *Klebsiella pneumoniae* Isolates from Summer-Harvested Louisiana Oysters, B. K. Boutin, P. L. Spaulding and R. M. Twedt, Division of Microbiology, Food and Drug Administration, 1090 Tusculum Avenue, Cincinnati, Ohio 45226

J. Food Prot. 49:442-444

Klebsiella pneumoniae isolates were recovered in increased numbers from oysters harvested during the warm months of the year from approved and classified waters. A total of 76 oyster isolates was examined using in vivo and in vitro assays. The nonpathogenic responses of the strains studied suggest that environmental strains are not a public health risk.

Occurrence of Aflatoxin and Aflatoxigenic Molds in Foods and Feed in Spain, V. Sanchis, N. Sala, A. Palomes, P. Santamarina and P. A. Burdaspal, Catedra de Microbiología, E. T. S. I. Agronomos, Universidad Politécnica de Cataluña, Ctra. Huesca km. 3, 25001 Lleida, Spain; Catedra de Microbiología, E. T. S. I. Agronomos, Universidad Politécnica de Valencia, Cno. de Vera s/n, 46020 Valencia, Spain; and Centro Nacional de Alimentación y Nutrición de Majadahonda, Majadahonda, Madrid, Spain

J. Food Prot. 49:445-448

A survey was carried out to obtain data on the occurrence of aflatoxin and aflatoxigenic mold contamination of foods in Spain. A variety of commodities amounting to 338 samples were analyzed, comprising cereal grains, mixed feeds, edible nuts, wheat flour for bread-making, biscuits, sliced bread, soya beans and breakfast cereals. The results reveal a rather low incidence of aflatoxin contamination in samples tested. Aflatoxins were detected in 4 of 27 samples of mixed feeds at levels below 5 $\mu\text{g}/\text{kg}$; one sample of peanuts was contaminated with 120 μg aflatoxin B₁/kg and 22 μg aflatoxin B₂/kg. Aflatoxins B₁ and B₂ were also detected in a lot of whole maize flour, averaging 8 $\mu\text{g}/\text{kg}$ and 3 $\mu\text{g}/\text{kg}$, respectively. Of a total of 288 samples tested, 100% showed variable incidences of fungal contamination. Maize samples were the ones most frequently contaminated with *Aspergillus flavus* (54.5%). Strains of *A. flavus* isolated from maize samples also showed the highest proportion of aflatoxigenic molds (17.2%) compared with those isolated from other sources.

Distribution of "Attached" *Salmonella typhimurium* Cells Between Poultry Skin and a Surface Film Following Water Immersion, H. S. Lillard, United States Department of Agriculture, Agricultural Research Service, Richard B. Russell Agricultural Research Center, P.O. Box 5677, Athens, Georgia 30613

J. Food Prot. 49:449-454

Poultry skin was immersed in a saline solution (0.85%) containing 10^8 *Salmonella typhimurium*/ml. After 0.25 min, 95% of the water uptake was in a surface film and 5% in the skin. After immersion for 30 and 60 min, a significant increase in

total water uptake occurred at each immersion time. A significant increase in the surface film occurred after 30 min of immersion, but not from 30 to 60 min. After 0.25 min of immersion, 94% of bacterial cells was entrapped in the water film and 6% was on the skin. As immersion time increased, the percentage of bacteria in the surface film decreased, whereas the percentage on the skin increased. After 60 min of immersion, about 39% of bacterial cells was in the surface film and 61% was on the skin. These data indicate a possible transfer of water and bacteria from surface film to skin during prolonged water immersion. Preventing the formation of the surface film by altering surface tension may reduce carcass contamination during immersion processes.

Effects of Connective Tissue Levels on Sensory, Instron, Cooking and Collagen Values of Restructured Beef Steaks, B. W. Berry, J. J. Smith and J. L. Secrist, Meat Science Research Laboratory, Agricultural Research Service, USDA, Beltsville, Maryland 20705 and Food Engineering Laboratory, U.S. Army Natick Research and Development Laboratories, Natick, Maryland 01760

J. Food Prot. 49:455-460

Two separate studies were conducted to evaluate variations in the amount of connective tissue remaining in beef muscle on resultant properties of flaked and formed steaks. Use of chucks rather than rounds as raw material produced greater tenderness, less sensory panel determined connective tissue and lower juiciness scores. As a team of trimmers repeated the instructed trimming procedures on round and chuck muscles over a 3-d period, it appeared that over this time more of the connective tissue was being removed from chuck and less from round muscles. For chuck muscles, more of the soluble collagen was being left on the muscles over the 3-d period. However, these differences in total and soluble collagen did not influence the properties measured. In a second study, which consisted of three (high, intermediate, low) levels of connective tissue in raw materials, texture profile panelists found a greater amount of gristle and webbed tissue (form of connective tissue) in steaks made from raw material with high connective tissue. These steaks with high connective tissue levels were also visually rated as more distorted and fibrous following cooking, with greater hardness and cohesiveness during first bite. Samples from the steaks had higher shear force and Newton values.

Growth and Aflatoxin Production by *Aspergillus parasiticus* in the Presence of Sodium Chloride, Fathy E. El-Gazzar, Gulam Rusul and Elmer H. Marth, Department of Food Science and The Food Research Institute, University of Wisconsin - Madison, Madison, Wisconsin 53706

J. Food Prot. 49:461-466

Twenty-five milliliters of glucose-yeast-salt medium containing 0, 2, 4, 6, 8, or 10% NaCl was inoculated to contain, approximately 10^5 or 10^7 conidia of *Aspergillus parasiticus* NRRL 2999 and then incubated at 13 or 28°C. Amounts of aflatoxin produced were determined using Reversed-Phase High Performance Liquid Chromatography (HPLC). Increasing the concentration of NaCl reduced accumulation of aflatoxin and

also induced a lag in growth of the culture. At 13°C, the mold produced small amounts of aflatoxin after an extended lag phase, and NaCl was markedly more inhibitory at 13 than at 28°C.

Survival of Salmonellae in Refrigerated, Agitated Water and Water/Glycol Mixtures, Edmund A. Zottola and Lorraine B. Smith, Department of Food Science and Nutrition, University of Minnesota, 1334 Eckles Avenue, St. Paul, Minnesota 55108

J. Food Prot. 49:467-470

Survival of *Salmonella typhimurium* in refrigerated water and a 30:70 mixture of ethylene glycol and water was studied. Survival was determined with an MPN procedure using 333 ml of the cooling medium. Initial populations were determined by spread plating 1 ml of sample on 3 plates of XLD. With water as the suspending medium, the temperature of the circulating water was 1°C. When the cooling medium was the glycol/water mixture, the temperature was -1°C. Low numbers of *S. typhimurium* were recovered from the cold water for 9 d and from the glycol/water mixture for 14 d. The initial population in the water was 310 CFU/ml and 630 CFU/ml in the glycol/water system. A preliminary survey of the pressure relationships in the cooling sections of HTST pasteurizers in 8 fluid milk plants showed that 3 had higher pressures on the coolant side than on the pasteurized side. Such a pressure relationship could result in the contamination of pasteurized milk with the cooling medium.

Isolation of *Aeromonas hydrophila* from Bottled Waters and Domestic Water Supplies in Saudi Arabia, Peter J. Slade, Mohammed A. Falah and Ahmed M. R. Al-Ghady, Ministry of Commerce, Quality Control Laboratory, Halat Amar (Tabuk), Saudi Arabia

J. Food Prot. 49:471-476

A total of 139 replicate samples of water were tested for *Aeromonas hydrophila* and coliforms. These consisted of 95 replicates from bottled mineral water, 13 replicates from flower petal infusions and 31 samples of domestic municipality supplies. Of these, 59 (43%) were positive for *A. hydrophila*, 15 (11%) were positive for coliforms and 11 (8%) positive for both *A. hydrophila* and coliforms. Most of the isolates of *A. hydrophila* came from various batches of one brand of bottled mineral water, none of which contained coliforms. The organism was isolated more frequently from newer samples, particularly those bottled for 59 d or less. Samples of treated water from one municipality were free from coliforms and *A. hydrophila*. Chlorinated water from another town was free from coliforms, but some samples contained *A. hydrophila*. In unchlorinated water from a third municipal source, there was a high degree of correlation between incidence of *A. hydrophila* and presence of coliforms. A selective method, using media without antibiotics, for isolation of *A. hydrophila* was used. A novel medium for the presumptive identification of *A. hydrophila*,

gelatin arginine dihydrolase (GAD) medium, was assessed, with confirmation of suspected isolates using the API 20E system. Of 109 isolates from two selective agars identified with the organism on API strips, 18 (16.5%) were falsely gelatinase negative in GAD medium, of which 9 (8.3%) also gave false-negative arginine dihydrolase reactions. Of those presumptively identified as *A. hydrophila* in GAD, 4/95 isolates (4.2% false-positives) were not confirmed.

Current Resuscitation Methods for Recovery of Stressed *Staphylococcus aureus* Cells from Foods, Gayle A. Lancette, Food and Drug Administration, Minneapolis Center for Microbiological Investigations, 240 Hennepin Avenue, Minneapolis, Minnesota 55401

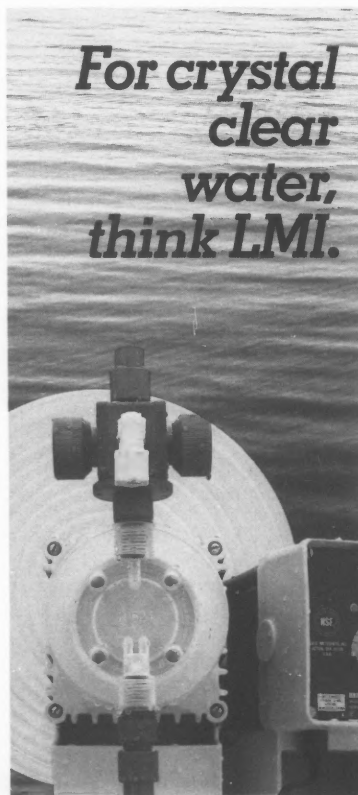
J. Food Prot. 49:477-481

Methods and media used to recover stressed and unstressed *Staphylococcus aureus* cells from foods are reviewed. Most probable number methods using Trypticase soy broth with 10% salt and 1% sodium pyruvate, a liquid modification of Baird-Parker agar and Giolitti and Cantoni's broth with Tween are discussed. Direct plating media reviewed are Baird-Parker agar, modified Vogel and Johnson agar, egg yolk-free Baird-Parker agar and single-step *Staphylococcus* selective agar.

Phosphates as Antibotulinal Agents in Cured Meats: A Review, M. K. Wagner, Department of Food Science, University of Wisconsin, 1605 Linden Drive, Madison, Wisconsin 53706

J. Food Prot. 49:482-487

Phosphates have been suggested as potential substitutes for the currently used nitrite in cured meat products, yet relatively little research has been done on the antibotulinal effects of phosphates. Phosphate selection for use in the cured meat industry continues to be based upon achieving certain functional objectives rather than microbiological control (i.e., improved tenderness, moisture retention, reduced shrinking during cooking, pH adjustments, emulsification, sequestration of ions). Current federal regulations limit addition of phosphates to amounts needed to achieve functionality. One notable exception is shelf-stable pasteurized processed cheese, cheese foods and cheese spreads, in which addition of phosphates for emulsification purposes also appears to provide antimicrobial or antibotulinal protection. It is, therefore, becoming evident that phosphates have the potential under certain conditions, of enhancing microbial or botulinal safety and stability of certain foods, with certain phosphates [i.e. sodium acid pyrophosphate (SAPP)] or mixture of phosphates displaying more effectiveness than others.



LMI chemical metering pumps are the result of three decades of pump design expertise, and offer features that will keep your water sparkling:

- Accurate and efficient feeding of water treatment chemicals
- Outputs of .0058 to 70 GPH (.022 to 265 LPH)
- Pressures to 300 PSI (20.7 Bar)
- Dual adjustability for 200:1 output range
- Corrosion proof housings and inherent pressure relief
- Easy adaptability to automatic control

Call us about your requirements or write today.



19 Craig Road
Acton, MA 01720-5495 U.S.A.
Telephone: (617) 263-9800
Telex: 95-1781


When you treat your water with LMI... the results are crystal clear.

READER SERVICE INFORMATION

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

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

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

Name _____

Company Name _____

Title _____

Address _____

City _____ State/Province _____

Zip _____ Country _____

Occupation _____

Phone Number () _____

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

Domestic expires 60 days after publication; Foreign 90 days

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

3-A Sanitary Standards for Wet Collectors for Dry Milk and Dry Milk Products

Number 43-00

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. Wet collector specifications heretofore or hereafter developed which so differ in design, material, fabrication, or otherwise, as not to conform to 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 one pass wet collectors for liquid entrapment and collection of particulates of dry milk and dry milk products from air exhausted, from a spray drying system, or an instantizing system, beginning at the air and liquid inlets and terminating at the air and liquid outlets. These standards include the manifold or distribution system for liquid as well as means for spraying liquid. The wet collector may include a venturi and connecting duct. If an air outlet duct is provided by the manufacturer, such duct is also covered by these standards. These standards do not include fans used in conjunction with collectors.

A.2

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

B

DEFINITIONS

B.1

Product: Shall mean milk and milk product.

B.2

Liquid: Shall mean the entrapment liquid which shall be safe water, milk, or a milk product.

B.3

Safe Water: Shall mean water from a supply properly located, protected, and operated and shall be of a safe sanitary quality. The water shall meet the standards prescribed in the National Interim Primary Drinking Water Regulations of the Environmental Protection

Agency Office of Water Supply — EPA-570/9-76-003.^{*1}

B.4

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

B.5

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

B.6

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^{*2} or corresponding ACI^{*3} types (See Appendix, Section E), or metal which under conditions of intended use is at least as corrosion-resistant as stainless steel of the foregoing types, and is non-toxic and non-absorbent, except that:

C.1.1

Rubber and rubber-like materials may be used for removable or bonded gaskets.

C.1.2

Rubber and rubber-like materials when used for the above specified applications shall comply with the applicable provisions of the 3-A Standards for Rubber and Rubber-Like Materials, Number 18-00.

C.1.3

Plastic materials may be used for sight and/or light ports and removable or bonded gaskets.

C.1.4

Plastic materials when used for the above specified applications shall comply with the applicable provisions of the 3-A Standards for Multiple-Use Plastics Material, Number 20-13.

^{*1}For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

^{*2}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., NW, Washington, DC 20036.

^{*3}Steel Founders' Society of America, Cast Metals Federation Bldg., 455 State St., Des Plaines, IL 60016.

C.1.5
Glass may be used in sight and/or light ports and shall be of a clear heat resistant type.

C.1.6
Bonded rubber and rubber-like materials and bonded 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.1.7
The final bond and residual adhesive of bonded rubber and rubber-like materials and bonded plastic-materials (if used), shall be non-toxic.

C.1.8
Single service sanitary-type gaskets may be used in connections which must be disassembled for cleaning.

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
All 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 continuously welded. 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.

D.3
Appurtenances having product contact surfaces shall be easily removable for cleaning, or shall be readily cleanable in place.

D.4
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.5
Wet collectors that are to be mechanically cleaned shall be designed so that the product contact surfaces and non-removable appurtenances thereto can be mechanically cleaned and are easily accessible for inspection.

D.6
Product contact surfaces shall be self-draining except for normal clingage.

D.6.1
The collector bottom shall be pitched to the outlet at least 3/4 inch per foot.

D.6.2
The product retention volume in gallons in the collector shall not exceed the feed rate in gallons/minute such that the average residence time shall not exceed one minute during normal operation except when:

D.6.2.1
Product is being discharged directly to the balance tank of the pasteurizer in an evaporator pasteurizer system, the liquid retention time shall not exceed 15 minutes during diversion.

D.7
Fittings in product contact surfaces shall conform 3-A standards for fittings, number 08-17 Rev. and/or to the applicable provisions for welded sanitary product pipelines found in the 3-A Practice for Permanently Installed Product-Pipelines, Number 605-02.

D.8
Gaskets having a product contact surface shall be removable or permanently bonded to the surface.

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 or the plastic material does not separate from the base material to which it is bonded.

D.10
Any gasket groove or gasket retaining groove, except in the bonded area, shall be no deeper than its width and shall not exceed 1/4 inch in depth or be less than 1/4 inch wide except those for standard O-Rings smaller than 1/4 inch.

D.11
All internal angles of 135 degrees or less on product contact surfaces shall have minimum radii of 1/4 inch except:

D.11.1
The minimum radii in gasket grooves or gasket retaining grooves other than those for standard 1/4 inch and smaller O-Rings shall be not less than 1/8 inch.

D.11.2
The minimum radii in grooves for standard 1/4 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.11.3
Where smaller radii are required for essential functional reasons, the angle must be readily accessible for cleaning and inspection.

D.12
There shall be no exposed threads on product contact surfaces except where required for functional and safety reasons such as those in liquid atomizing nozzles.

D.13

Means of access to inspect product contact surfaces shall be provided.

D.14

The inside dimension of a manhole opening, if provided, shall be not less than 15 inches by 20 inches if oval or 18 inches in diameter if round.

D.14.1

The upper edge of a top manhole opening shall be not less than 3/8 inch higher than the surrounding area. If an exterior flange is incorporated in it, it shall slope and drain away from the opening. Covers for manholes in the top of wet collectors shall be of the outside swing type.

D.14.2

The sleeve or collar of a side wall and/or end manhole for an inside swing-type manhole cover shall be pitched so that liquids cannot accumulate. Covers for manholes in side walls and/or ends shall be of the inside or outside swing type. If cover swings inside it shall also swing outside away from the opening. Threads of ball joints employed to attach a manhole cover and its appendage shall not be located within the wet collector.

D.15

Sight and light openings, when provided shall be of such design and construction that the inner surfaces drain inwardly, and if the wet collector is designed for mechanical cleaning, the inner surface of the glass or plastic shall be relatively flush with the inner surface of the wet collector. 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 3-3/4 inches.

D.16

Thermometer connections, when provided, shall conform to the 3-A Standards for Instrument Fittings and Connections, Number 09-07.

D.17

Wet collectors whose inside height exceeds 96 inches shall be provided with means for mechanically cleaning the product contact surfaces of the wet collector and all non-removable appurtenances.

D.18

In drying systems in which the wet collector and the drier or instantizer are not wet cleaned at the same time, positive means shall be provided to prevent moisture from the wet collector entering dry product areas of the drier.

D.19

The air outlet ductwork of the wet collector downstream of the product contact surface that is a part of and furnished by the wet collector manufacturer shall drain away from the product contact surface. A pitch of at least 3/8 inch per foot to the first vertical drop or drain point of the ductwork shall be provided.

D.20

The means of support shall provide a clearance between the lowest part of the wet collector and the floor, with the exception of legs, of (1) at least 6 inches when the wet collector outlines an area in which any point is less than 36 inches from the nearest edge of the area or (2) a clearance of at least 8 inches when any point is more than 36 inches from the nearest edge.

D.21

Legs, if provided, shall be smooth with rounded ends and have no exposed threads. Legs made of hollow stock shall be sealed.

D.22

Insulation, if provided, shall be covered with a material conforming to the criteria in C.2 and installed in such a manner to prevent liquid and other contaminants from accumulating between the insulation and the surfaces being insulated.

D.23

Non-product contact surfaces shall have a smooth finish, be readily cleanable, and shall be free of cracks and crevices.

D.23.1

Surfaces to be coated shall be effectively prepared.

D.23.2

External supporting members, braces, guards, catwalks, stairs and handrails are considered as part of the building structure, i.e., walls, floors, and ceilings are not considered non-product contact surfaces of this equipment.

APPENDIX

E

STAINLESS STEEL MATERIALS

Stainless steel conforming to the applicable composition ranges established by AISI² for wrought products, or by ACI³ 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 steel 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 ASTM⁴ specifications A296-68 and A351-70.

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

AIR VENTING

During the cleaning cycle, wet collectors when

con't. p. 275

⁴Available from ASTM, 1916 Race St., Philadelphia, PA 19103.

3-A Sanitary Standards for Bag Collectors for Dry Milk and Dry Milk Products

Number 40-01

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. Bag collector specifications heretofore or hereafter developed which so differ in design, material, fabrication, or otherwise, as not to conform to 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 bag collectors for dry cloth entrapment and collection of particulates of dry milk and dry milk products from air exhausted from a spray drying system, or an instantizing system beginning at the air inlets of the bag collector and terminating at the air exhaust and product outlets.

A.2

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

B

DEFINITIONS

B.1

Product: Shall mean dry milk and dry milk products.

B.2

Bag: Shall mean filter media to serve as the entrapment medium in a stream of air containing suspended particulates.

B.3

Product Contact Surface: Shall mean all surfaces that are exposed to the product, or airborne product, terminating at the air filtering media, or from which liquids and/or solids may drain, drop, or be drawn into the product.

B.4

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.

B.5

Exhaust Air Contact Surfaces: Shall mean the surfaces or the air ducts, plenum chamber(s) (if provided) and appurtenances from the final product contact surface and terminating at the air outlets.

B.6

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

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 metal which under conditions of intended use is at least as corrosion-resistant as stainless steel of the foregoing types, and is non-toxic and non-absorbent, except that:

C.1.1

Aluminum alloys conforming to the Aluminum Association^{*3} designates 5052 and 6061 and an Optional Aluminum Alloy conforming to the composition found in Appendix, Section G may be used (1) for venturi for air not to be heated and (2) as a product contact surface for dry product for star wheel rotors that are removed for cleaning, rotary air locks, diverter (flipper) valves, and a supporting or reinforcing member in lightweight moving parts.

C.1.2

Aluminum alloy conforming to the aluminum Association designate A-360, A-380, A-319 and A-315G, may be used for construction of reverse jet venturi and compressed air distribution valves.

C.1.3

Rubber and rubber-like materials may be used for short flexible connectors and removable or bonded gaskets.

C.1.4

Rubber and rubber-like materials when used for the above specified applications shall comply with the applicable provisions of the 3-A Standards for Rubber and Rubber-Like Materials, Number 18-00.

^{*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 & Steel Institute, 1000 16th St., NW, Washington, DC 20036.

^{*2}Steel Founders' Society of America, *Cast Metals Federation Bldg.*, 455 State St., Des Plaines, IL 60016.

^{*3}Aluminum Association, 818 Connecticut Ave., NW, Washington, DC 20006.

C.1.5

Plastic materials may be used for short flexible connectors, removable or bonded gaskets, coatings (as provided for in Section C.2 and C.3 herein), filter media, and sight and/or light openings.

C.1.6

Plastic materials when used for the above specified applications shall comply with the applicable provisions of the 3-A Standard for Plastic Materials, Number 20-13.

C.1.7

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

C.1.8

Bonded rubber and rubber-like materials and bonded 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.1.9

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

C.1.10

Cotton, linen, silk, wool, or synthetic fibers may be used for separation of product from exhaust air. These materials shall be non-shedding, non-toxic, relatively insoluble, easily cleanable, and shall not impart a flavor to the product.

C.2

Exhaust air contact surfaces for bag collector systems which clean by air reversal, except for those of flexible connectors, fans, dampers, and other mechanical parts shall be of stainless steel with no open chamber seams.

C.2.1

Exhaust air contact surfaces for bag collector systems which do not clean by air reversal shall be considered non-product contact surfaces.

C.3

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

All 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 F).

D.2

Permanent joints in metallic product contact surfaces

shall be continuously welded. Welds shall be smooth and pit free and shall be at least as smooth as a finish obtained with 80 grit silicon carbide. Intricate fabricated and/or machined components shall be as smooth as a finish obtained with 80 grit silicon carbide, with welds smooth and pit free.

D.3

Appurtenances having product contact surfaces shall be easily removable for cleaning, or shall be readily cleanable in place.

D.4

Product contact surfaces shall be easily accessible for cleaning and inspection either when in an assembled position or when removed. Removable parts shall be readily demountable.

D.4.1

Product contact surfaces and exhaust air contact surfaces not designed to be cleaned by hand shall be designed for mechanism cleaning.

D.5

Gaskets having a product contact surface shall be removable or bonded.

D.6

Bonded rubber and rubber-like material and bonded plastic material having product contact surfaces 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 or the plastic material does not separate from the product contact surface.

D.7

Gasket retaining grooves in product contact surfaces for removable gaskets shall not exceed 1/4 inch in depth and, except those for standard O-Rings smaller than 1/4 inch, shall be at least 1/4 inch wide.

D.8

Internal angles of 135 degrees or less on product contact surfaces shall have radii of not less than 1/4 inch, except that:

D.8.1

The radii in gasket grooves or gasket retaining grooves for removable gaskets, except for those for standard 1/4 inch and smaller O-Rings, shall be not less than 1/8 inch.

D.8.2

The radii in grooves for standard 1/4 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.8.3

Radii for fillets of welds in product contact surfaces where the thickness of one or both parts joined is 3/16 inch or less shall be not less than 1/8 inch.

D.8.4

Where smaller radii are required for essential functional reasons such as those on internal parts of mechanical collectors, collector systems, air lock blades, air distribution devices, and conveying

mechanism, the radii shall not be less than 1/32 inch.

D.9 Means of access to inspect product contact surfaces shall be provided.

D.10 The inside dimension of a manhole opening, if provided, shall be not less than 15 inches by 20 inches if elliptical or 18 inches in diameter if round. The upper edge of a top manhole opening shall be not less than 3/8 inch higher than the surrounding area and if an exterior flange is incorporated in it, it shall slope and drain away from the opening. The sleeve or collar of a manhole opening for an inside swing-type of manhole cover shall be installed in a vertical position and pitched so that liquids cannot accumulate.

D.11 Sight and light openings may be provided.

D.12 Where air from a separate source is used for cleaning and/or purging, the air supply shall comply with the applicable criteria contained in 3-A Accepted Practices, Number 604-03 for Air Under Pressure, except for Sections C.3, D.3.3 and D.4.2, or Number 607-03 for Spray Drying Systems.

D.12.1 Air distribution piping and fittings downstream of the disposable filter (ref. D.12.3) shall be of stainless steel except compressed air distribution valves may be made of cast aluminum. Air distribution piping, internal to the collector, shall be smooth and free of imperfections such as pits, folds, and crevices in the final fabricated form and readily demountable. Slip connections with O-Ring seals conforming to Section D.8 may be used.

D.12.2 The manifold shall be of stainless steel with no open seams.

D.12.3 A disposable media final filter, complying with the specifications for disposable filters in the 3-A Accepted Practices for Air Under Pressure Number 604-03, shall be positioned upstream from the collector air manifold. The filter shall be as close to the manifold as possible and shall be readily accessible.

D.13 Non-product contact surfaces shall have a smooth finish, be readily cleanable and those to be coated shall be effectively prepared for coating. Non-product contact surfaces shall be free of cracks and crevices. Insulation, if provided, shall be covered with a material conforming to the criteria in C.2 or C.3.

D.14 Exhaust air contact surfaces shall be accessible and readily cleanable. If no other means of easy access for cleaning is available, panels or doors shall be provided. They shall be constructed in a manner that will

prevent the entrance of unfiltered air, and shall use hinges, wing nuts, latches, and similar easy opening devices to allow easy access without special tools. Hinges shall be separable and readily cleanable. They shall not be of a continuous (piano) type.

D.15 When means are provided for conveying the product from the bag collector, the means shall comply with the applicable 3-A Sanitary Standards or Accepted Practices.

APPENDIX

E

STAINLESS STEEL MATERIALS

Stainless steel conforming to the applicable ranges established by AISI¹ for wrought products, or by ACI² 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 steel 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 ASTM⁴ specifications A296-68 and A351-70.

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

OPTIONAL ALUMINUM ALLOY

An acceptable alloy is covered by Danish Standards DS #3002, and is designated #4261. Equivalent U.S. standards are designated ASTM B179 S12c, and Aluminum Association #C413.

H

RECOMMENDATIONS FOR CLEANING BAG COLLECTORS

H.1

DRY CLEANING PROGRAM

H.1.1

Disassemble and thoroughly vacuum or dry brush clean all product contact surfaces of the bag collector. Reassemble as soon as finished and keep all parts dry.

H.1.2

Inspect bag cages, venturis, and similar parts for their condition. Any necessary repair or replacement should be made as soon as possible.

H.1.3

Thoroughly clean all external parts of the bag collector.

H.2

WET CLEANING PROGRAM

H.2.1

Disassemble and remove all loose dry product. Then

⁴Available from ASTM, 1916 Race St., Philadelphia, PA 19103.

rinse all parts with clear water and follow with a thorough hand brushing of all parts using a general purpose cleanser. Rinse thoroughly to remove all cleaning solution or soil. It is recommended that hot water (170 degrees F/77 degrees C) or above be used for rinsing in order to sanitize the equipment and to promote drying.

Allow all parts to air dry completely prior to reassembly. Wet washing should be done as necessary. After cleaning, drying and reassembly, all openings should be protected against recontamination.

H.3

GENERAL

H.3.1

Vacuum cleaning is preferred to brush cleaning or cleaning with air under pressure as it decreases dust drift to other areas of the plant.

H.3.2

Brushes or vacuum cleaner fittings used for cleaning product contact surfaces should not be used for cleaning non-product contact surfaces or for other uses which might result in contamination. Such tools should be made of materials that can be cleaned and sanitized and shall not have wooden parts nor be of mild steel or other iron products that will rust. Such brushes and special fittings should be stored in an enclosed cabinet when not in use. For protection and housekeeping considerations, such cabinets should be of non-wood construction and should have open mesh metal shelving.

These standards shall become effective September 25, 1986, at which time the "3-A Sanitary Standards for Bag Collectors for Dry Milk and Dry Milk Products", Number 40-00, are rescinded and become null and void.

3-A Sanitary Standards No. 43-00, *con't. from p. 271*

cleaned mechanically should be vented adequately by opening the manhole door to prevent vacuum or pressure build-up due to sudden changes in temperature of very large volumes of air. Wet collectors having a manhole(s) opening in the side wall that will be open during cleaning should be provided with means to prevent excess loss of cleaning solution through the opening. The use of tempered water of about 95 degrees F (35 degrees C) for both pre-rinsing and post rinsing is recommended to reduce the effect of flash heating and cooling. Provisions should be made to prevent overfilling with resultant vacuum or pressure damage to the wet collector.

H

The volume of liquid retention in the collector bottom should be maintained at a minimum and should not exceed the maximum volume described in D.6.2

I

PLACEMENT

Wet collector equipment, with the exception of the exhaust to atmosphere section, should be in a processing area.

These standards shall become effective September 25, 1986.

NOW

HEPAC AIR CURTAIN

- Removes Air-Borne Contaminents
- Assures Highest Standards of Air Filtration

High Efficiency Particulate Air Curtain The Mars HEPAC Air Curtain prevents contaminated air from penetrating any room where clean air is critical, while it constantly cleans the air and filters out particles as small as 0.3 microns. Easy-to-install inside and above the door opening of the room being protected—needs no structural changes. Includes H.E.P.A. filter and prefilter. For use anywhere clean, filtered air is needed. Immediate Delivery. For brochure or information write or call:



17920 S. Figueroa Street
Gardena, California 90248
(213) 770-1555 Outside CA 1-800-421-1266

Please circle No. 181 on your Reader Service Page

1986

June 9-20, **COOKIE TECHNOLOGY**. For more information contact: Bev Martin, Research Department, American Institute of Baking, 1213 Bakers Way, Manhattan KS 66502.

June 13-14, **WATER ACTIVITY: THEORY AND APPLICATIONS**, Institute of Food Technologists & International Union of Food Science and Technology 10TH BASIC SYMPOSIUM, to be held at the Grenelefe Hotel, Dallas, TX. For more information contact: Miss Marlene Myszkowski, Institute of Food Technologists, 221 North LaSalle Street, Suite 300, Chicago, IL 60601. 312-782-8424.

June 16-19, **BASIC FOOD PLANT MICROBIOLOGY**. For more information contact: Shirley Grunder, Sanitation Education Department, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

June 23-27, **CRACKER TECHNOLOGY**. For more information contact: Bev Martin, Research Department, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

June 29-July 2, **29TH CONFERENCE OF THE CANADIAN INSTITUTE OF FOOD SCIENCE AND TECHNOLOGY**, to be held in Calgary, Alberta, Canada. For more information contact: Terry Smyrl, Ph.D., Alberta Horticultural Research Center, Brooks, Alberta, Canada, T0J 0J0. 403-362-3391.

June 30-July 3, **SPECIALITY INGREDIENT AND PROCESSING (COOKIE)**. For more information contact: Bev Martin, Research Department, American Institute of Baking, 1213 Bakers Way, Manhattan KS 66502.

July 12-19, **SIXTH INTERNATIONAL WORKSHOP ON RAPID METHODS AND AUTOMATION IN MICROBIOLOGY**, to be held at Kansas State University. For more information concerning Program contents contact: Daniel Y.C. Fung, Call Hall, Kansas State University, Manhattan, KS. 66506. 913-532-5654. For registration information contact: Joe Pittle, Conference Center, Wareham building, Anderson Avenue, Manhattan, KS 66502. 913-532-5575.

July 14-18, **TECNOLOGIA DE PRODUCCION DE PAN (BREAD PRODUCTION FOR SPANISH SPEAKING BAKERS)**. For more information contact: Donna Mosburg, Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

July 14-18, **IN-STORE BAKERY TRAINING-FROZEN DOUGH OPERATIONS**. For more information contact: Donna Mosburg, Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

July 15-19, **PURDUE CANNERS TECHNICIANS MOLD COUNT SCHOOL**. For more information contact: Dr. James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907. 317-494-8279.

July 21-25, **PRINCIPLES OF BAKERY PRODUCTION-BREAD OR CAKE**. For more information contact: Donna Mosburg, Registrar,

American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

July 22-25, **FOOD SAFETY TRAINING COURSE** to be held at the Holiday Inn-University Center, Gainesville, Florida. For more information contact: Sara Jo Atwell, ABC Research Corporation, 3437 SW 24th Avenue, Gainesville, FL 32607. 904-372-0436.

AUGUST 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.

August 4-8, **CANNING TECHNOLOGY COURSE**, to be held at Cornell University - NYSAES, Geneva, NY. For more information contact: D. L. Downing. 315-787-2273.

August 10-15, **1986 ANNUAL MEETING OF THE SOCIETY FOR INDUSTRIAL MICROBIOLOGY** to be held at the Sheraton-Palace Hotel, San Francisco, CA. For more information contact: Mrs. Ann Kulback - SIM Business Secretary, SIM Headquarters, P.O. Box 12534, Arlington, VA 22209. 703-941-5373.

September 15-17, **IFDA ADVANCED FOODSERVICE BUYERS SEMINAR** to be held at Tysons Corner Marriott Hotel. For more information contact: Chuck Brimmer. 703-532-9400.

September 20 - October 3, **1986 XXII INTERNATIONAL DAIRY CONGRESS**, The Hague, The Netherlands. For more information contact: H. Wainess, Secretary U.S. National Committee of the IDF (USNAC), 464 Central Avenue, Northfield, IL. 312-446-2402.

September 22-26, **70TH ANNUAL SESSIONS OF THE INTERNATIONAL DAIRY FEDERATION**. For more information contact: Congress Organizing Department, c/o Netherlands Congress Centre, P.O. Box 82000, 2508 EA The Hague, The Netherlands. You may also contact: H. Wainess, Secretary U.S. National Committee of the IDF, 464 Central Avenue, Northfield, IL. 312-446-2402.

September 23-25, **WYOMING PUBLIC HEALTH SANITARIANS ASSOCIATION ANNUAL MEETING**, to be held at the Holiday Inn, Thermopolis, WY 82443. For more information contact: William George, 118 1/2 N. 11th, Worland, WY 982401. 307-347-2617.

September 23-26, **FOOD SAFETY TRAINING COURSE** to be held at the Holiday Inn-University Center, Gainesville, Florida. For more information contact: Sara Jo Atwell, ABC Research Corporation, 3437 SW 24th Avenue, Gainesville, FL 32607. 904-372-0436.

October 21-22, **CALIFORNIA ASSOCIATION OF DAIRY AND MILK SANITARIANS ANNUAL MEETING**, to be held at Holiday Inn Downtown, Fresno, CA. For more information contact: Richard C. Harrell,

1554 West 120th St., Los Angeles, CA 90047. 213-757-9719.

October 27-29, **1986 INTERNATIONAL WHEY CONFERENCE**, sponsored jointly by the Whey Institute and the International Dairy Federation, O'Hare Marriott Hotel, Chicago, IL. For more information contact: Conference Secretariat, Whey Products Institute, 130 North Franklin Street, Chicago, IL 312-782-5455.

November 1-6, **FOOD SANITATION 29TH ANNUAL NATIONAL EDUCATIONAL CONFERENCE & EXPOSITION**, Scottsdale, Arizona. For more information contact: Harold Rowe at 813-586-5710 or write: Jean Day, Registrar, Food Sanitation Institute, 1019 Highland Ave., Largo, FL 33540.

1987

AUGUST 2-6, IAMFES ANNUAL MEETING to be held at the Disneyland Hotel, Anaheim, CA. For more information contact: Kathy R. Hathaway, IAMFES, Inc., P.O. Box 701, Ames, IA 50010. 515-232-6699

September 26-30, **DFISA's FOOD & DAIRY EXPO '87**, to be held at McCormick Place, Chicago, IL. For more information contact: DFISA, 6245 Executive Boulevard, Rockville, MA 20852. 301-984-1444.

Minneapolis in 86 Don't Miss It



**August
3-7, 1986**

**IAMFES
73rd Annual
Meeting**



Networking

Education

**Don't
Miss
It!**

Friends

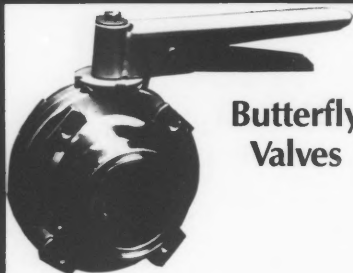
Awards



Quality and choice.

Leading European Technology in Stainless Steel Sanitary Flow Control Products

Please circle No. 139 on your Reader Service Page



Butterfly Valves

- Available with air-to-air or air-to-spring actuators.
- 304 or 316 stainless steel.
- Meets 3A Standards.
- Sizes from 1-4 inches.



Check Valves

- Bi-directional flow option reduces C.I.P. piping cost.
- 304 or 316 stainless steel.
- Normal check valves available in 1-4 inches.

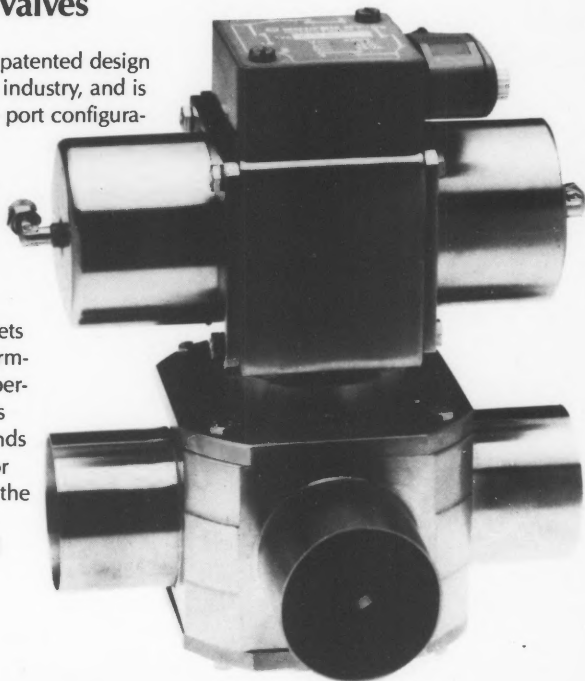


Piston Valves

- Available with 2, 3, 4, and 5 ports.
- Easily changed from spring-to-close to air-to-close.
- Sizes 1-4 inches.
- Double-seated valves designed for C.I.P. and brewery applications also available.

KOLTEK Valves

The KOLTEK Valve is a patented design unlike any other in the industry, and is available in 2, 3, and 4 port configurations, in all sizes. Simple field conversions from manual to pneumatic can easily be made. A 3-way valve can be 2, 3, or 4 position simply by changing actuators. It sets new standards in performance, economy, and operating versatility, and has been proven in thousands of applications by major companies throughout the world. KOLTEK Valves meet 3A Standards and are designed for easy cleaning-in-place.



Pumps



Hackman offers a complete line of centrifugal and self-priming pumps. Extremely high lifting heights are possible with liquid ring self-priming pumps. The self-priming pumps are used in applications where air mixes with the liquid, and as a C.I.P. return pump. All parts exposed to liquid are 316 stainless steel. Available in 7.5, 10, and 20 horsepower.

Meters



Hackman manufactures a complete line of rotary piston meters, air eliminators, and other flow control units.



HACKMAN FLOW

P.O. Box 28, Brunswick, Georgia 31520

Phone: (912) 264-0950

Telex: 293593

