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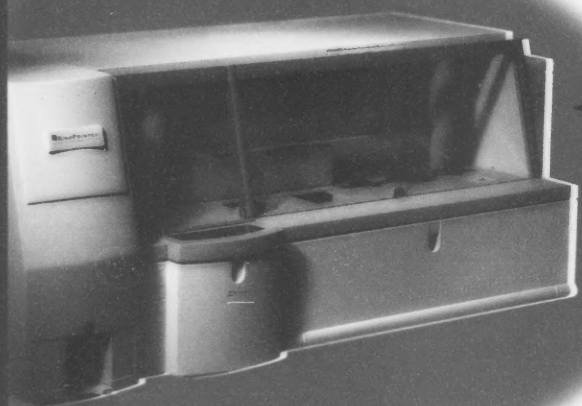
# Sanitation

A PUBLICATION OF THE INTERNATIONAL ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS, INC.

JULY 1996

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- 1997 Call for Awards
  - IAMFES Policy on Commercialism
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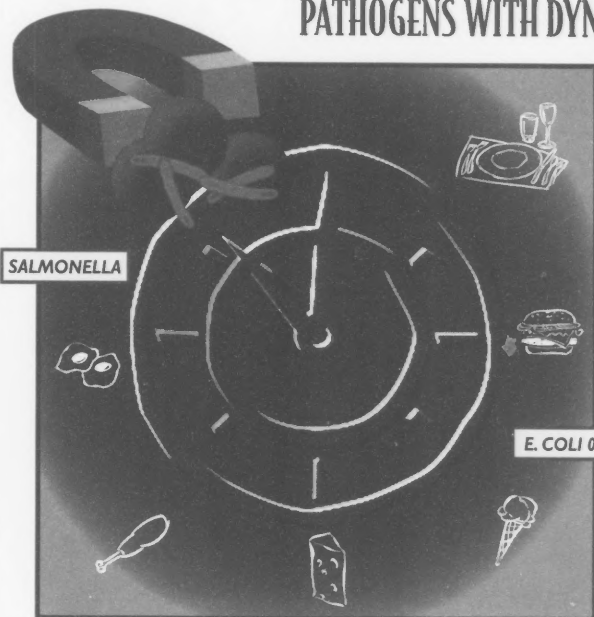
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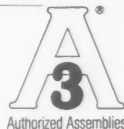
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## Editor's Note:

In the May 1996 DFES issue on page 300, the article "Limitations of Bimetallic-Coil Thermometers in Monitoring Food Safety in Retail Food Operations" had some miscalculations for Celsius conversions. The correct conversions are:

0.1°F (ca. 0.056°C)  
200°F (ca. 93.3°C)  
220°F (ca. 104.4°C)  
150°F (ca. 65.6°C)  
95°F (ca. 35°C)

We apologize to the author for the error.

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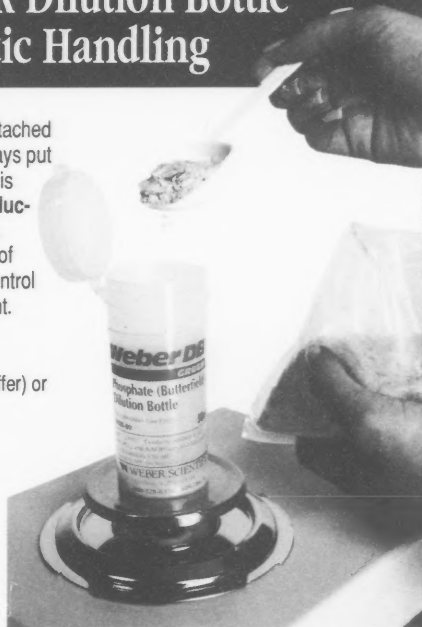
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# Sanitation

A PUBLICATION OF THE INTERNATIONAL ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS, INC.

**Dairy, Food and Environmental Sanitation** (ISSN-1043-3546) is published monthly beginning with the January number by the International Association of Milk, Food and Environmental Sanitarians, Inc. Each volume comprises 12 numbers. Printed by Heuss Printing, Inc., 911 N. Second Street, Ames, IA 50010, USA. Periodical Postage paid at Des Moines, IA 50318 and additional entry offices.

**Postmaster:** Send address changes to **Dairy, Food and Environmental Sanitation**, 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2863, USA.

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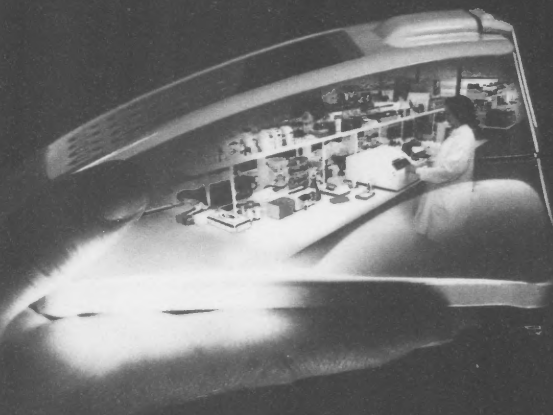
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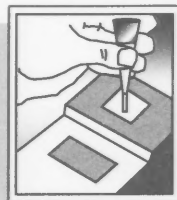
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# THOUGHTS

## FROM THE PRESIDENT



By MICHAEL H. BRODSKY,  
IAMFES President

### “Off the top”

As I sat down to write my first column for DFES as President of IAMFES, I wondered how many of you actually take the time to read the commentary written by the Executive Director, or the President. We don't really know, because we never ask for and rarely receive your comments or criticisms about anything we have said. With my column, I would like to change your passive interest in IAMFES to one of active involvement. IAMFES is your professional organization. The Executive Board is elected to represent your interests and hires the Executive Director to manage our organization. Together we ensure that the services IAMFES provides meet your needs and expectations. If we are to fulfill this mandate, then we need your input.

To begin with, I want each of you to take a few minutes after you receive your monthly issue of DFES to read my column. (You should, of course, also read the column by the Executive Director.) Then, I want you to either fax me (416-235-5951), call me (416-235-5717), write me or send me an e-mail (brodskm@epo.gov.on.ca), to express your views, either in support of, or criticizing, what I have said. If you wish, I will keep my sources confidential. As your President, I promise to listen to your opinions with an open mind and to bring your plaudits or concerns before the Executive Board. It is my goal this year to get the silent majority to speak out and take a more proactive role in running our organization.

I intend to organize my columns around the primary operative functions of IAMFES, namely member-

ship (individual professional, corporate, student and affiliate), publications and finance. My comments will give you a sense of the direction I want to see IAMFES take in each of these areas. In addition, I will use this opportunity to present a frank discussion of our status in each of these crucial areas and some ideas of what I think we need to do.

Our financial situation is of particular concern. In 1995/96, IAMFES incurred unexpected expenditures in legal fees and costs related to discharging our responsibilities to the previous Executive Manager, interviewing and hiring a new Executive Director, and an ongoing civil suit with a former employee. If we are to become financially solvent, we will need to find innovative ways to increase our revenues, while at the same time holding down our expenses. We may need to consider increasing membership dues as well as increasing the charges for our publications, particularly to nonmembers; however, we may also need to explore the role of the affiliates and the lack of their financial obligation to the parent organization. We may need to reevaluate the cost-sharing arrangement between the host affiliate and IAMFES for the Annual Meeting. I will discuss these issues in more detail in future columns. Please let me know your thoughts.

Remember there are three kinds of volunteers: those who simply watch things happen, those who wonder why things happen, and those who make things happen. I want to help you become a member of IAMFES who makes things happen. Let's work together!



# Support Your IAMFES Foundation Fund



To support the IAMFES Foundation Fund, send donations (**marked Foundation**) to: IAMFES, 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2863

## What Is the IAMFES Foundation Fund?

The Foundation Fund is supported by membership of IAMFES sustaining members. Sustaining members are corporations, companies and individuals whose business interests reflect the goals and mission of IAMFES. Funds in the Foundation are kept totally separate from the operating funds of IAMFES and are used for worthy causes, which enrich the Association.

## What does the Foundation Fund support?

Revenue from the Foundation Fund currently supports the IAMFES:

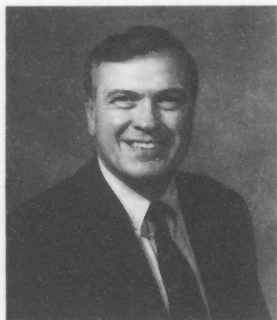
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- Developing Scientist Oral and Poster Competition
- Shipment of volumes of surplus JFP and DFES journals to developing countries through FAO in Rome
- Recruitment of exceptional speakers for IAMFES Annual Meetings on late breaking topics

## Why should I contribute to the IAMFES Foundation Fund?

Any contribution, no matter how large or how small, will help build a secure Foundation for the future of IAMFES. The future of IAMFES depends on how well we can meet the needs of our membership in providing educational programs, journals, products, and services, and on how well IAMFES fulfills its mission. The Foundation Fund was created to provide a long-lasting legacy of information and service for protecting the milk, food, water, and environment throughout the world.

# PERSPECTIVES...

From the Executive Director



By DAVID M. MERRIFIELD,  
IAMFES Executive Director

## “IAMFES wants you”

As a child, I remember the military recruiting poster where this man in red, white and blue was pointing at me, with the caption, “Uncle Sam Wants You!” As the child, I naively thought this poster was why so many people joined to fight in WW II. Little did I realize it was not the poster, but the belief in the cause, purpose, mission and objective, along with a lot of hard, one-on-one recruitment work.

Recruiting members for an association is a lot like recruiting soldiers. We publish posters, ads, slogans, and columns like this, usually with minimal effect. Significant membership increases take a cause, purpose, mission, and objective, but mostly a lot of hard, one-on-one recruitment work.

I know all of you who are IAMFES members believe in the association, or you wouldn't belong, and most of you would like to see membership and involvement increase. But what commitment have you made to increase membership and involvement? Since membership development really boils down to one-member-inviting-another to join, increasing membership is ultimately your responsibility.

Take the following brief quiz (adapted from Richard Ensman's article in *Convene*, December, 1993) to determine just what you're doing to foster increased membership.

Answer each question with “often,” “sometimes,” or “rarely.”

1. I clip articles from IAMFES journals of interest to prospective members and pass them along.
2. I mention IAMFES activities to my contacts in my business and professional activities.
3. I invite peers and colleagues to “sample” IAMFES through involvement in short-term activities.
4. I make at least one phone call each month to prospective members inviting them to get involved.
5. I'm quick to share IAMFES experiences with colleagues.
6. When a friend or colleague becomes involved, I make sure he or she receives thanks and recognition from IAMFES.
7. I bring prospective members to IAMFES meetings, social gatherings and conventions.
8. I keep IAMFES journals, information, educational materials, and membership applications in my office and share them with prospective members whenever the opportunity arises.
9. I educate prospective members as to IAMFES benefits and explain how to obtain them.
10. I offer ideas and advice on membership recruitment to the office and Executive Board.

11. I offer my own informal orientation to IAMFES members I recruit.

12. I offer prospective members a complete “menu” of activities and committees that would welcome their involvement.

13. I make a mental inventory of the skills and talents of prospective members and try to match them up with IAMFES needs.

14. I introduce new members at meetings.

15. I ask the advice of new and prospective members on IAMFES and industry/profession issues.

16. I keep a running log of prospective members, with information about their needs and concerns.

17. I maintain contact with my new members and make sure their IAMFES experiences are positive ones.

18. When I'm not successful in recruiting a new member, I try to find out why they won't join.

19. I talk with new and prospective members to find out which IAMFES services are right for them.

20. When I recruit a prospective member, I act as his or her mentor.

21. I keep track of membership boosting strategies offered by IAMFES and try to put them into practice.

22. I keep my eyes and ears open for successful membership development activities of other associations.

Be honest. How many of these activities do you really perform “often,” or even “sometimes?” If you put just six of these activities into practice on a regular basis, you're doing a tremendous service for IAMFES. If you practice these activities “rarely,” or not at all, pick a half-dozen that you can make a part of your professional life each month... be firm in your follow-through!  
“IAMFES Wants You!”

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# Efficiency of Disinfecting Agents to Destroy *Listeria monocytogenes*, *Yersinia enterocolitica* and *Staphylococcus aureus* on a Contaminated Surface

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Health of Animals and Food Laboratory

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## SUMMARY

In an effort to prevent the potential contamination risk of laboratory personnel or food-service workers with pathogenic bacteria, the efficiency of three commonly used disinfecting agents was evaluated for their bactericidal activity at 20°C against *Listeria monocytogenes* Scott A, *Yersinia enterocolitica* ATCC 23715, and *Staphylococcus aureus* attached to a stainless-steel surface by using the AOAC use-dilution method at various exposure times (2, 5, and 10 min). Our results indicate that all disinfectants tested were more efficient on stainless steel contaminated by the three microorganisms after 10 min of contact time. However, the limit concentration of all disinfectants was at least two to three times higher than those recommended by the manufacturer to eliminate *L. monocytogenes*, *Y. enterocolitica*, and *Staphylococcus aureus* on stainless-steel surfaces after 2 min of exposure. Also, our data suggest that when surface decontamination was achieved at 5 min, concentrations of each disinfectant showed different behavior on all organisms tested except in Dettol where the active compounds were able to destroy *L. monocytogenes* and *Y. enterocolitica*. The findings of this study demonstrated the need for adequate exposure time of disinfectants for the removal of bacterial cells on contaminated work surfaces.

## INTRODUCTION

In a laboratory or in a food-service establishment, work surfaces are often known to be contaminated as a result of accidental spills or contact with soiled materials containing pathogenic bacteria such as *Listeria monocytogenes*, *Yersinia enterocolitica*, and *Staphylococcus aureus*, the last of which produces several types of enterotoxins causing gastroenteritis (14).

During the past few years, these pathogens have been a growing concern to health authorities of the public sector due to an apparent increase of outbreaks in many countries such as the United States, Europe, Australia, and Canada (5, 11, 14, 22, 23). The recorded incidence of illnesses associated with these organisms throughout the world represents a major concern for lab personnel or the food-services industry, because



these organisms can easily attach to surfaces and cross-contaminate food product or expose workers to contamination once the surfaces are not decontaminated adequately.

The importance of disinfecting working surfaces cannot be underestimated in order to eliminate or control any bacterial cells which may be present when infectious agents are spilled. In practice, once the work surface is contaminated, the application of disinfectant sprays following by wiping with absorbent paper is the approach that many laboratories use to decontaminate the surface and subsequently minimize the risk of contamination of laboratory workers and materials.

In recent years, there has been a considerable increase in the number of germicidal products available on the market, but no single agent or procedure is adequate for all purposes (9). Several authors indicate that the choice of any disinfectant and the practical procedure to be used for laboratory or for food-processing environmental disinfection essentially depends on a variety of considerations, including: (i) bactericidal activity against microorganisms, (ii) experimental conditions of the study, (iii) disinfectant concentration, (iv) degree of cleanliness of the surface to be treated, (v) mechanisms of action and spectra of activity, and (vi) level of surface contamination and contact time (6, 20, 21).

The need for safe and effective use of chemical disinfectant procedures is of great practical importance in controlling the accumulation and spread of any disease-causing microorganisms present on work surfaces and other contaminated materials (13). However, work surfaces may acquire an attached microbial population when surrounded by a microbial suspension and serve as a potential source of transmission of disease to anyone working in a laboratory. The ability of microorganisms to become more resistant to disinfectants and other antimicrobial agents once they become attached to a surface such as stainless steel, glass, or polypropylene has been documented (4, 12, 15, 16, 17).

Recently there have been a few reports in situations where the control of bacteria on laboratory or food-service work surfaces is sought (1, 10). Walter and Kundsinn (24) have evaluated the effectiveness of floor-cleaning procedures in a hospital environment and outlined the activities that resulted in contamination of the air in the room. Brayment et al. (7) compared two different washing procedures for decontaminating rubber boots in an animal-disease facility and concluded that neither of the procedures was completely effective.

Several reports have addressed the use of Dettol, Sterol, and Tor to decontaminate surfaces. Generally, surface treatments with the disinfectants at varying concentrations resulted in a reduction of microbial density (8). The manufacturers suggested that about 2.5% Dettol and 1.0% Sterol were adequate to control surface contamination. Also, the manufacturer recommended washing work surfaces with a solution containing 1.6% Tor to remove infectious material which might be present. However, it is not known if these chemical products completely decontaminate treated objects or surfaces. Thus, it is important to know that in many cases, after spills of infectious agents on work surfaces, the time elapsed between the simple application of a disinfectant solution followed by wiping with an absorbent paper often does not exceed more than 2 min. It is difficult to ensure that this practice is effective for destroying pathogenic bacteria on the treated surfaces or objects.

Accordingly, contact time plays an important role in the efficacy of disinfecting agents; it becomes clear that this situation may substantially increase the risk of exposure to the microorganism if the disinfectant agents are not really effective.

Given the significant potential for bacterial contamination of laboratory or food-service work surfaces during manipulations, the aim of this study was to investigate the efficacy of commonly used disinfecting agents to disinfect a stainless-steel surface contaminated by *Listeria monocytogenes*, *Yersinia enterocolitica*, and *Staphylococcus aureus* for various

contact times using the AOAC dilution method, the official procedure for evaluating the bactericidal activity of disinfectants (2).

## MATERIALS AND METHODS

### Microorganisms, media, and culture conditions

Cultures of *Listeria monocytogenes* Scott A (a clinical isolate obtained from the collection of E. P. Ewan, Laboratory Center for Disease Control, Health and Welfare Canada, Tunney's Pasture, Ottawa, Ontario), *Yersinia enterocolitica* ATCC 23715 (American Type Culture Collection, Rockville, MD), and *Staphylococcus aureus* (provided by Health of Animals and Food Laboratory, St-Hyacinthe, Quebec) were used throughout this study. These bacterial cultures were maintained on Trypticase soy agar (TSA) (BBL Microbiology Systems, Cockeysville, MD) slants supplemented with 1% yeast extract (Difco Laboratories, Detroit, MI) at 4°C.

Each stock culture was streaked onto Trypticase soy agar-yeast extract (TSA-YE) plates supplemented with 4% bovine blood and incubated at 37°C for 18 to 24 h, except for *Y. enterocolitica*, which was incubated at 25°C. Following the incubation periods, colonies of each strain were then inoculated separately in a vial containing 5 ml of Trypticase soy broth (TSB) (BBL), with 1% yeast extract and incubated for 18 to 24 h at 37°C. One milliliter of each suspension was transferred to a 50-ml Erlenmeyer flask containing 9 ml of Bacto-Disinfectant test broth (DB) (Difco) which was incubated at 37°C for 24 h on a Lab-line orbit environmental shaker (Melrose Park, IL) at 100 rpm to routinely yield cell densities of  $2.0 \times 10^8$  CFU/ml.

Each culture (1 ml, containing  $10^8$  CFU/ml) was used to inoculate a second 50-ml Erlenmeyer flask containing 9 ml of Disinfectant broth (DB) which was incubated at 37°C for 48 h on the same shaker before contaminating stainless steel surface. A viable count using Trypticase soy agar was performed on these last cultures.

### Test surface

Polished stainless-steel penicylinders (type 304, SS-8, finish no. 4, 8-mm o.d., 6-mm i.d., and 10-mm length (Fisher Scientific Co., Pittsburgh, PA) were used. This material is commonly found in biohazard laboratory work surfaces.

Before use, the stainless-steel surface was soaked overnight in 1 N NaOH, washed thoroughly with water, rinsed three times in tap water and twice in distilled water. Ten cylinders of each type were placed in 20 by 150 mm test tubes, covered with 15 ml of fresh 0.1% Bacto-asparagine (Difco) and sterilized 15 min at 120°C before being held at room and cold temperatures until ready for use, according to the AOAC use-dilution method (3).

### Disinfecting products

The commercial disinfection products studied in this study are listed in Table 1. All disinfectant dilutions were prepared with distilled deionized water according to the manufacturer's instructions. Also, all the glassware used was rinsed three times with distilled deionized water.

### Test procedures

The test stainless-steel surface was aseptically dipped for 15 min at 20°C in a vial containing 10 ml of the 48 h bacterial suspension in DB, which was directly proportional to the number of cylinders (i.e., 1 ml of DB culture per cylinder), according to the AOAC use-dilution method (3).

Following inoculation, the cylinders were removed from the broth suspension with a flamed wire hook and aseptically placed on end in sterile glass Petri dishes (no more than 10 per dish) matted with two layers of 9 cm diameter Whatman No. 2 filter paper (Whatman, Clifton, NJ, USA). Special care was taken to remove culture broth inside the penicylinders. The dishes, half-opened, were dried at 37°C for 30 min before disinfecting the surface.

After this drying period, each contaminated penicylinder was aseptically transferred, at 30-s intervals, according to the AOAC use-dilution

Table 1. Composition of disinfecting agents used

Product	Supplier	Active agents
Dettol	Reckitt & Colman Ltd Lachine, Qué., Canada	Chloro-xyleneol Isopropyl alcohol
Sterol	V-TO Products St-Hyacinthe, Qué., Canada	N-alkyldimethylbenzylammonium chlorides
Tor	Huntington Laboratories Bramalea, Ont., Canada	Sodium carbonate N-alkyldimethylbenzylammonium chlorides Sodium metasilicate

method (3), to glass tubes containing 10 ml of the various disinfecting solutions at concentrations from 0.1%, increasing by 0.1% increments, as described by Mafu et al. (17), and maintained for 10 min at 20°C. The contaminated cylinders were then transferred to Lethen broth, a culture medium (Difco Laboratories, Detroit, MI), and incubated at 37°C for 48 h.

Results were reported as positive (growth) or negative (no growth). The critical disinfection point (CDP), i.e., the minimum concentration necessary to disinfect a surface, was calculated from 5-tube assays for each disinfecting agent according to Mafu et al. (17). Higher or lower concentrations were tested until the lowest limit value was obtained, i.e., 5 negative tubes (absence of growth). Two repetitions of 5 tubes without growth and at least one test of 10 tubes were then needed to confirm each CDP value. Overall, about 200 assays for each strain were done in this study.

### RESULTS AND DISCUSSION

The overall variation in the efficacy of different disinfectant agents (widely used commercial products) against *Listeria monocytogenes*, *Yersinia enterocolitica*, and *Staphylococcus aureus* following contact-surface contamination and disinfection for 2, 5, and 10-min periods at ambient temperature (20°C), is shown in Table 2.

The results of this study indicate that after 2 min of exposure time, the manufacturer recommended con-

centration of Dettol (2.5%) was not able to decontaminate the stainless-steel surfaces contaminated with *L. monocytogenes* and *S. aureus* (Table 2). However, this chemical agent seems to be effective in destroying *Y. enterocolitica* cells after this contact time. A Dettol concentration lower than that recommended by the manufacturer was sufficient to decontaminate *Y. enterocolitica* on stainless-steel surfaces.

The results of the present study indicate that after 2 min of exposure time, no strain of the three microorganisms tested was destroyed by Sterol and Tor at the manufacturer's recommended concentration (1% for Sterol and 1.6% for Tor). Two- to nine-fold the recommended concentration was required for each product to disinfect the stainless-steel surface contaminated with these microorganisms (Table 2).

Furthermore, Table 2 shows that after 5 min of exposure time at ambient temperature (20°C), the concentrations of 0.9 and 0.5% respectively of Dettol were needed to destroy *L. monocytogenes* and *Y. enterocolitica* on a stainless-steel surface. These results suggest that the concentration of Dettol was two or three times lower than that recommended by the manufacturer to assure the complete destruction of these bacteria on a contaminated stainless-steel surface. When the contact time was increased for 10 min, this product seems to be effective against *L. monocytogenes* and *Y. enterocolitica* at a concentration from three to five times lower than that recommended by the manu-

TABLE 2. Efficacy of disinfecting agents against *Listeria monocytogenes*, *Yersinia enterocolitica*, and *Staphylococcus aureus* on contaminated stainless-steel-surface at 20 C

Disinfectant	Critical disinfection point (CDP) <sup>a</sup>								
	Test organisms								
	<i>L. monocytogenes</i>			<i>Y. enterocolitica</i>			<i>S. aureus</i>		
	Contact time (min)								
	2	5	10	2	5	10	2	5	10
Dettol	8.2	0.9	0.9	1.8	0.5	0.5	>25	>25	>25
Sterol	2.4	1.2	0.28	5.2	0.7	0.5	9.4	2.5	1.2
Tor	3.8	0.9	0.16	10.8	3.3	2.0	12.7	4.8	3.6

<sup>a</sup>Required concentrations (%) for surface decontamination.

facturer. However, this study indicates that despite the Dettol high concentration of 25% used, this product did not appear to be effective for decontaminating facilities that may be contaminated with *S. aureus*. Thus, the nature of this organism appears to play a role in the efficacy of disinfectants tested in this study. As stated earlier by Mead (18) as well as Mead and Adams (19), *S. aureus* possesses the capability to colonize surfaces and develop a resistance to cleaning and disinfecting agents. Also, the authors noted that *S. aureus* can produce extracellular materials that increase resistance and aids persistence of this organism on work surfaces, especially when cracks are present.

With regard to Sterol, a disinfectant designed specifically for areas where housekeeping is of prime importance in controlling pathogenic bacteria, this product did not appear to affect the three microorganisms tested at the recommended concentrations after 2 min of exposure (Table 2). However, after 5 minutes of exposure, Sterol concentrations of 1.2, 0.7, and 2.5% appear effective against *L. monocytogenes*, *Y. enterocolitica* and *S. aureus* respectively. When the contact time was increased for 10 min, concentrations of Sterol three and two times lower than those recommended by the manufacturer were

required to destroy *L. monocytogenes* and *Y. enterocolitica*. *S. aureus* was destroyed at the concentration of 1.2% Sterol (Table 2).

Tor was not able to destroy any of the three microorganisms tested after 2 min of exposure time at the manufacturer's recommended concentrations. As shown in Table 2, concentrations 2, 6, and 7 times higher than those recommended by the manufacturer were necessary to disinfect the surface contaminated with *L. monocytogenes*, *Y. enterocolitica* and *S. aureus* respectively. Except for *L. monocytogenes*, which was destroyed at the lower manufacturer's recommended concentration (0.9%), concentrations two and three times higher were necessary to be able to destroy *Y. enterocolitica* (3.3%) and *S. aureus* (4.8%) on surfaces after 5 min of exposure (Table 2).

When surface decontamination was continued for 10 min of contact time, concentrations of Tor 10 times lower than those recommended were necessary to disinfect the surfaces contaminated by *L. monocytogenes* and *Y. enterocolitica* while concentrations of Tor two times higher (3.6%) than those recommended were necessary to destroy *S. aureus* on surfaces.

As demonstrated by the results, it becomes clear that the nature of the

organism and the contact time between a disinfectant and an infectious agent plays an important role in the efficacy of disinfection agents on contaminated surfaces. This exposure time can vary from 2 to 3 min for hand and surface disinfection to several hours for instrument soaking. It is therefore desirable for a disinfectant to have a high bactericidal activity-to-time exposure ratio, and the selection of a 1-min exposure time gave a reproducible time interval and a realistic picture of the usual practices of routine laboratory surface disinfection.

These results concur with the data of previous studies in which it was reported that the effect of exposure time is an important variable affecting the efficiency of disinfectants (13, 17). Also, as has been previously reported (4), various species of bacteria may show varying resistance to disinfectants. These authors indicate that *Listeria* spp. cells dried onto surfaces were more resistant to disinfectants than those in suspension. They noted that 3.8% of an ammonium compound were ineffective against *L. monocytogenes*. The present study indicates that the concentration of disinfectant agents required for destruction of microorganisms on contaminated surface was dependent on the exposure time.

In view of the bactericidal efficiency of the three disinfectants tested, use of Sterol provided the highest germicidal activity and appears to be well suited to a wide range of applications in laboratory or food-service stainless-steel work surfaces. Dettol seems effective on *L. monocytogenes* and *Y. enterocolitica* but not for *S. aureus*. The results of this study provides laboratories and food services with information to help choose effective work-surface disinfecting products and regimens that reduce the risk of contamination. However, it is the responsibility of the end user to ensure that the products are used appropriately and regimens are adhered to as required as appropriate to each situation. In addition, the conditions under which an infectious agent is used are of concern to laboratory safety. Large volumes and high concentrations of infectious agents in growth media evidently pose greater risks than smears of the same infectious agent on a microscope slide. Other unusual manipulations may also increase the hazard.

Assuming that cells adhering to surfaces might behave differently than cells in suspension when exposed to disinfectant agents, good cleaning practice, and appropriate selection of disinfectant for work surfaces when activities are completed or immediately after spills of potential infectious materials provides a solution to breaking the disease risk and preventing the contamination problem, especially in an environment where various infectious materials are used on porous surfaces.

#### ACKNOWLEDGMENTS

The cooperation of Dr André Gagnon, Health of Animal and Food Laboratory, Agriculture and Agri-food Canada, St-Hyacinthe, Québec, Canada, is greatly appreciated.

#### REFERENCES

1. Angelotti, R., M. J. Foter, K. A. Busch, and K. H. Lewis. 1958. A comparative evaluation of methods for determining bacterial contamination of surfaces. *Food Res.* 23: 175-185.
2. Association of Official Analytical Chemists. 1980. Official method of analysis, p. 56-68. *in* W. Horwitz (ed.), *Official methods of analysis*, 14th ed., Assoc. Offic. Anal. Chem., Arlington, VA.
3. Association of Official Analytical Chemists. 1984. Disinfectants. p. 65-77. *In* W. Horwitz (ed.), *Official methods of analysis*, 14th ed., Assoc. Offic. Anal. Chem., Washington, D.C.
4. Best, M., M. E. Kennedy, and F. Coates. 1990. Efficacy of a variety of disinfectants against *Listeria* spp. *Appl. Environ. Microbiol.* 56:377-380.
5. Black, R. E., R. J. Jackson, T. Tsai, M. Medvesky, M. Shayegani, J. C. Feeley, K. I. E. MacLeod, and A. M. Wakelee. 1978. Epidemic *Yersinia enterocolitica* infection due to contaminated chocolate milk. *N. Engl. J. Med.* 298: 76-79.
6. Block, S. S. *Disinfection, sterilisation, and preservation*. 3rd (ed.), Lea and Febiger, Philadelphia, PA.
7. Braymen, D. T., J. R. Songer, and J. F. Sullivan. 1974. Effectiveness of footwear decontamination method for preventing the spread of infectious agents. *Lab. Anim. Sci.* 24:888-894.
8. Dunsmore, D. G., and M. A. Thomas. 1981. Bacteriological control of food equipment surfaces by cleaning system: a review. *J. Food Prot.* 3:220-240.
9. Dunsmore, D. G., A. Twomey, W. G. Whittlestone, and H. W. Morgan. 1981. Design and performance of systems for cleaning product-contact surfaces of food equipment: a review. *J. Food Prot.* 3:220-240.
10. Fevero, M. S., J. J. McDade, J. A. Robertson, R. K. Hoffman, and R. W. Edwards. 1968. Microbial sampling of surfaces. *J. Appl. Bacteriol.* 31:336-343.
11. Fleming, D. W., S. C. L. Cochi, K. L. MacDonald, J. Brondum, P. S. Hayes, B. D. Plikaytis, M. B. Holmes, A. Audurier, C. V. Broome, and A. L. Reingold. 1985. Pasteurized milk as a vehicle of infection in outbreak of listeriosis. *N. Engl. J. Med.* 312:1656-1661.
12. Frank, J. J., and R. A. Koffi. 1990. Surface adherent growth of *Listeria monocytogenes* associated with increased resistance to surfactant sanitizers and heat. *J. Food Prot.* 53:550-554.
13. Geese, J. H. Sanitation: the key to food safety and public health. *Food Technol.* 12:74-80.
14. Halpin-Dohnalek, I. M., and E. H. Marth. 1989. *Staphylococcus aureus*: production of extracellular compound and behavior in foods: a review. *J. Food Prot.* 52:267-282.
15. Krysinski, E. P., L. J. Brown, and T. J. Marchisello. 1992. Effect of cleaners and sanitizers on *Listeria monocytogenes* attached to products contact surfaces. *J. Food Prot.* 4:246-251.
16. Mafu, A. A., D. Roy, J. Goulet, and P. Magny. 1990. Attachment of *Listeria monocytogenes* to stainless steel, glass, polypropylene, and rubber surfaces after short contact times. *J. Food Prot.* 53:742-746.
17. Mafu, A. A., D. Roy, J. Goulet, L. Savoie, and R. Roy. 1991. Efficiency of sanitizing agents for destroying *Listeria monocytogenes* on contaminated surfaces. *J. Dairy Sci.* 73:3428-3432.
18. Mead, G. C. 1985. Significance of staphylococci in poultry processing and products. *Meat Hyg.* 48:24-26.
19. Mead, G. C., and B. W. Adams. 1986. Chlorine resistance of *Staphylococcus aureus* isolated from turkeys and turkey products. *Lett. Appl. Microbiol.* 3:131-133.
20. Mosley, E. B., P. R. Elliker, and H. Hays. 1976. Destruction of food spoilage, indicator and pathogenic organisms by various germicides in solution and on stainless steel surface. *J. Milk Food Technol.* 12:830-836.
21. Orth, R., and H. Mrozek. 1990. Is the control of *Listeria*, *Campylobacter* and *Yersinia* a disinfection problem? *Fleischwirtsch. Int.* 2:17-18.
22. Schlech, W. F., P. M. Lavigne, R. A., Berjtolussi, A. C. Allen, E. V. Haldane, A. J. Wort, A. W. Hightower, S. E. Johnson, S. A. King, E. S. Nicholls, and C. V. Broome. 1983. Epidemic listeriosis evidence by transmission by food. *N. Engl. J. Med.* 308:203-206.
23. Tacket, C. O., J. P. Narain, R. Sattin, J. P. Lofgren, C. Koningsberg, Jr., R. C. Rentorff, A. Rausa, B. R. Davis, and M. L. Cohen. 1984. A multistate outbreak of infections caused by *Yersinia enterocolitica* transmitted by pasteurized milk. *JAMA.* 251:483-486.
24. Walker, C. W., and R. B. Kundsins. 1960. The floor as the reservoir of hospital infections. *Surg. Gynecol. Obst.* 11:412-422.



# Introduction to the Hazard Analysis Critical Control Point (HACCP) Concept in a Small Meat-Processing Plant

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## SUMMARY

Baseline data on physical and chemical contamination and microbial levels were collected in a meat plant with <15 employees and high employee turnover. The process of meat grinding and patty production were identified as critical control points (CCPs) since written sanitation standard operating procedures had not been developed at this facility. Cotton knit gloves, knives, and plastic lugs were sources of microbial contamination. Educational training sessions emphasizing food safety and good manufacturing practices were held with plant personnel. After hazard analysis critical control point (HACCP) implementation, total aerobic and coliform counts on some equipment were reduced from <5.0 log CFU/cm<sup>2</sup> to <2.0 log CFU/cm<sup>2</sup>. Fresh beef products had >5.0 log CFU/cm<sup>2</sup> and >3.0 log CFU/cm<sup>2</sup> total aerobic and coliform counts, respectively, prior to HACCP implementation. Total aerobic, total coliform, and psychrotrophic counts in fresh pork sausage and pork chops ranged from <1.0 to 3.4 log CFU/cm<sup>2</sup> after HACCP implementation.

## INTRODUCTION

Consumers and regulatory personnel are concerned about the risk of foodborne illness. For a 14-year period, the Centers for Disease Control reported that beef was implicated in 9% of all outbreaks of foodborne disease and 10% of all cases in the U.S. (4). *Salmonella* spp., *Clostridium perfringens*, and *Staphylococcus aureus* were the main organisms involved in beef-related foodborne outbreaks. In addition, undercooked ground beef has been implicated as a vehicle for *Escherichia coli* O157:H7 in numerous foodborne outbreaks since 1982. An outbreak of *E. coli* O157:H7 in undercooked beef patties served at restaurants in the Pacific Northwest focused attention on the severity of foodborne illnesses. Despite a steady decrease in the proportion of foodborne outbreaks and cases associated with beef during the past 15 years, it still remains a significant vehicle for foodborne illnesses, second only to finfish (4).

Hazard analysis critical control point (HACCP) principles are a recognized means to minimize the risk of foodborne illness (8). The HACCP plan, a systematic approach to food

safety, has been adapted to some commercial food-processing and food-service operations (3). The HACCP concept calls for identifying biological, physical and chemical hazards associated with steps in the manufacture of a product. Controls are established and systematically monitored to prevent creation of a hazard (13).

No data are available to indicate that meat products from small- and medium-sized plants have been implicated in more outbreaks of foodborne illnesses than those from larger plants, nor can such an assumption be made currently. Nonetheless, concern has been expressed regarding HACCP issues facing small plants (12). Many small meat-locker and processing plants may have difficulty implementing HACCP plans because of limited economic, personnel, and equipment resources. The objective of this study was to improve good manufacturing practices (GMPs) and sanitation standard operating procedures (SOPs), and to implement a HACCP plan in a small meat-processing plant.

## MATERIALS AND METHODS

### Meat plant section

A screening process was used to select a meat-processing plant with 15 or fewer employees. A letter and questionnaire were sent to eligible Kansas plants to learn about individual plant operations. On the basis of questionnaire results, six plants were selected for further consideration as potential facilities to implement a model HACCP program. Plant visits and meetings were conducted prior to plant selection. A state-operated facility employing inmates was selected. A high rate of employee turnover led to a real need for a HACCP plan to be implemented at this plant.

### Baseline evaluation

An assessment was conducted to screen products and evaluate operational procedures. Product-handling practices were evaluated for potential cross-contamination problems. Product-flow diagrams were outlined

and used to conduct a hazard analysis. Potential physical, chemical, and microbiological hazards were identified for each production process. Baseline data on physical and chemical contamination and microbial levels were collected. Baseline values were used to develop preliminary HACCP plans and to provide reference values to evaluate the impact of the HACCP program after implementation. A preliminary study also was conducted to evaluate several microbiological sampling methods.

**Physical and chemical hazard evaluation.** Prior to initiation of processing operations, mechanical equipment was inspected visually for loose fittings. A subjective visual inspection was conducted during employee break periods to examine freshly ground meat for foreign objects.

A sensitive test for a broad spectrum of antimicrobial drugs, the Charm Farm Test for Beef and Veal Steaks (Charm Sciences Inc., Malden, MA), was used to detect antibiotic residues. Over a 4-day period, 6 steaks, 3 briskets, 1 tenderloin and 4 ground-beef samples were collected at the plant and tested for antibiotics residues. The products were sealed in stomacher bags, overwrapped with brown paper, and then stored in a -23°C freezer for three days. The samples subsequently were transported to Kansas State University (KSU) in an ice chest maintained at 4°C, then stored at -19°C. All samples were thawed in a refrigerator at 0-4°C for 12 h prior to analysis.

### Microbial hazard evaluation

**Temperature profile.** Temperatures of the meat plant environment and products were monitored during 3 days of production. Temperatures of all processing and storage areas, plus the temperatures of products being fabricated at each work station, were recorded at different times during each shift. The temperature readings taken at all sites were within established State and U.S. Department of Agriculture (USDA) recommendations.

**Air sampling.** Air samples of the plant environment were taken at

7 sites on 2 days using a Surface Air Sampler (SAS, Pool Bioanalysis Iltiana, Milano, Italy) (1). The SAS was preset at 1 unit, 20 s, 60 liters for each sample. Total aerobic counts (15), total coliform counts (7), and yeast and mold counts (11) were determined using plate count agar (PCA), violet red bile agar (VRBA), and potato dextrose agar, respectively. All media and broth used for this research were obtained from Difco Laboratories (Detroit, MI), unless otherwise indicated. Plates were incubated aerobically at 32°C for 48 h, 37°C for 24 h, and 30°C for 5 to 7 days, respectively. Two samples were taken at each site and each air sample was plated in duplicate. To determine the microbial level in log colony forming units/m<sup>3</sup> (log CFU/m<sup>3</sup>), the following formula was used: log CFU/m<sup>3</sup> = (log CFU per plate × 1,000 liters/m<sup>3</sup>/60 liters).

Results from this preliminary evaluation demonstrated that the atmospheric environment was not a significant source of microbial contamination. Total aerobic plate counts averaged 2.2, 1.6, 2.5, 2.5, 4.4, 1.3 and 2.1 log CFU/m<sup>3</sup> in the processing room, chill room, men's restroom, lunch room, office, at the plant's entrance, and in the holding pens respectively. Coliforms were only detected in the chill room (2.2 log CFU/m<sup>3</sup>) and at the plant's entrance (1.3 log CFU/m<sup>3</sup>). Yeast and mold counts were between 1.3 and 1.9 log CFU/m<sup>3</sup> for all the sites listed above. Further microbial evaluations focused on contamination of meat products from equipment surfaces and initial contamination levels in raw materials.

**Meat plant equipment.** Cotton knit gloves, knives, cutting surfaces, plastic lugs, the band saw, meat grinders, and a patty maker were selected for evaluation. In addition, microbial samples were collected from the walls and trolleys in the chill room and from processing room walls. Samples were collected prior to and during daily meat-processing operations using the swab method, the contact method, and for the catalase test during the baseline evaluation. The schedule for sample collection using these three techniques and the number of

**TABLE 1. Sample numbers and collection schedule using the swab method, contact method and catalase test for baseline microbiological evaluation of meat-plant equipment before and during daily operations in a meat-processing facility, prior to initiation of the HACCP system**

Microbiological sample collection site	Microbiological samples: collection periods and numbers											
	Swab method				Contact method				Catalase method			
	Preprocessing		During processing		Preprocessing		During processing		Preprocessing		During processing	
Period (days)	Samples (n)	Period (days)	Samples (n)	Period (days)	Samples (n)	Period (days)	Samples (n)	Period (days)	Samples (n)	Period (days)	Samples (n)	
Cattan knit gloves	5	9	5	10	5	9	5	10	5	9	5	10
Knives	5	10	5	10	5	10	5	10	5	10	5	10
Cutting tables	5	10	5	10	5	10	5	10	5	10	5	10
Plastic lugs	0	0	5	10	0	0	5	10	0	0	5	10
Band saw	4	4	5	5	4	4	5	5	4	4	5	5
Meat grinders	5	18	5	18	5	18	5	18	5	18	5	18
Patty maker <sup>a</sup>	2	6	2	6	0	0	0	0	0	0	0	0
Processing-room walls	0	0	5	5	0	0	5	5	0	0	5	5
Chill-room walls and shackles	0	0	5	10	0	0	5	10	0	0	5	10

<sup>a</sup>Use of this equipment was limited during data collection period.

samples collected are presented in Table 1.

**Swab method.** A sterile template having an inside area of 103.23 cm<sup>2</sup> (16 in<sup>2</sup>) was placed on the surface to be sampled. Using a sterile swab premoistened by dipping into 10 ml of sterile phosphate buffer (PB), the surface area exposed by the template was wiped three times in three directions and the swab replaced in the PB tube (14). Serial dilutions were made from each sample.

Total aerobic, total coliform, *Escherichia coli*, and psychrotrophic counts were determined in duplicate using 3M Petrifilm Plates (3M Microbiology Products, St. Paul, MN). Plates were incubated aerobically at 32°C for 48 h, 37°C for 24 h, 37°C for 24 h, and 7°C for 10 days, respectively.

**Contact method.** Microbial samples were collected by placing a Replicate Organism Direct Agar Contact (RODAC) plate in direct contact with the equipment surface (9). Total aerobic and total coliform counts were

determined in duplicate using PCA and VRBA, respectively, and incubated as previously described.

**Catalase method.** Following the method described by Wang and Fung (16), a sterile swab was premoistened by dipping it into a tube containing 5 ml of 3% hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) and wiped across the equipment surface exposed by a sterile template having an inside area of 25.81 cm<sup>2</sup> (4 in<sup>2</sup>). The swab was replaced into the 3% H<sub>2</sub>O<sub>2</sub> and the tube was sealed.

Catalase, an enzyme produced by bacteria and found in meat, blood, and fat, reacts with hydrogen peroxide to form bubbles. By observing the amount of bubbles produced, an assumption about the amount of meat, blood, or fat, or the number of bacteria was made. If no bubbles appeared, the surface was presumed to be relatively clean. If bubbles appeared, meat, blood, fat and/or bacteria were present, indicating that the surface should be cleaned. A subjective scale of 1 to 4 was used to quantitate cata-

lase activity where 1 is few bubbles; 2, some bubbles; 3, many bubbles; and 4, excess bubbles.

**Pathogen detection from meat plant equipment.** Microbial samples were obtained from equipment surfaces to analyze for *Salmonella* spp., *S. aureus*, and *C. perfringens*. To detect *Salmonella* spp., a sterile swab was dipped into a tube containing 10 ml of sterile lactose broth (LB). The equipment surface was wiped following the procedure previously described for the swab method and the swab replaced into LB. The LB tube was incubated aerobically at 37°C for 24 h. Next, 0.1 ml of the suspension was removed aseptically from the LB and transferred to 10 ml of selenite cystine broth. An additional 0.1 ml of LB suspension was transferred aseptically into 10 ml of tetrathionate broth. These broths were incubated aerobically at 37°C for 24 h. Brilliant green sulfa agar (BGSA) was used to isolate *Salmonella* spp., using procedures described by Flowers et al. (15).

Serology testing for *Salmonella* spp. was performed by placing one drop of Bacto *Salmonella* O antiserum and one loopful of sample from the triple sugar iron agar (TSIA) slant onto a slide. Samples on slides were examined for positive agglutination, which was identified by the presence of granules in the mixture (5).

To detect *S. aureus*, a sterile swab was dipped into a tube containing 10% NaCl tryptic soy broth (TSB). The equipment surface was wiped following the procedure previously described for the swab method and the swab replaced into the TSB. The TSB tube was incubated aerobically at 37°C for 48 h. Following incubation, the suspension was streaked onto *Staphylococcus* #110 agar plates, which were incubated aerobically at 37°C for 24 h. A loopful of typical golden yellow colonies was transferred from the plates into 10 ml of brain heart infusion broth (BHI) and incubated aerobically at 37°C for 24 h.

A coagulase test was performed by mixing 0.5 ml of the BHI suspension with 0.5 ml of Bacto coagulase plasma (BCP) and incubating it aerobically at 37°C for 4 h. The sample was considered positive for *S. aureus* if a 4+ coagulation was observed (10).

The Fung double tube method was used to detect *C. perfringens* (2). Using the swab method described previously, a sterile swab was dipped into 10 ml of sterile PB. The equipment surface was wiped, and the swab replaced into the PB. One milliliter of the suspension then was removed and aseptically transferred into 22.5 ml of Shahidi Ferguson *perfringens* agar containing 1.8 ml of *D*-cycloserine. An inner tube was inserted and the apparatus was incubated aerobically at 37°C for 24 h. Black colonies, if present, were needle picked and stabbed into motility test medium and incubated aerobically at 37°C for 24 h. Motility-negative samples were indicative of a presumptive positive test for *C. perfringens*.

**Microbial evaluation and pathogen detection in beef products.** A 25-g portion of thawed sample was stomached in 25 ml of PB for 2 min. Total aerobic, total coliform,

*E. coli* and psychrotrophic counts were determined in duplicate using Petrifilm as previously described for plating swab samples.

To assay for *Salmonella* spp., *S. aureus*, and *C. perfringens*, an enrichment step was conducted. From the stomached samples, a 1-ml sample was added to 99 ml of BHI broth and incubated aerobically for 24 h at 37°C. Next, one milliliter of the suspension was removed and subsequently pre-enriched and plated as previously described for pathogen detection from meat plant equipment.

### Educational training

Food safety, hygiene and GMPs were introduced using videotapes and slides. The videotape "Principles and Rules for Meat Safety: Employee Hygiene Practices for Meat and Poultry Processors," developed by Silliker Laboratories and produced in cooperation with the Scientific Affairs Committee of the American Meat Institute, copyright 1990, was used. This tape emphasizes the relationship between personal hygiene and microbial contamination of meat products.

The slide show "Safe Food Processing: You're the Key—Sanitation Program for Food Processing Personnel" by Gravani and Goldstein (Cooperative Extension Service, Cornell University) focused on the food industry and microbiological principles. A videotape produced by the Cooperative Extension Service at KSU, 1993, entitled "Catalase Test" also was used. This tape demonstrated how the catalase test can be used to estimate the level of microbial contamination on equipment surfaces and in meat samples.

All plant personnel participated in the training which was given in two 3-h sessions at the end of two processing days one week apart. All personnel took part in sanitation demonstrations. Employees touched their hands onto PCA plates before and after washing and after sanitizing hands. Plates were compared visually to observe the effectiveness of handwashing and sanitization. Knives and raw meat were sampled to evalu-

ate their microbial loads. Microbial sampling, plating and evaluation procedures, and the development of monitoring systems also were discussed.

### HACCP implementation

On the basis of the initial microbial counts for equipment and meat products, CCPs were identified by a team consisting of the plant manager and assistant manager, an Extension Food Systems Specialist, an extension assistant, and a food microbiologist from KSU. The process of meat grinding and patty production were identified as CCPs since this facility did not have written SOPs developed. These steps were monitored by visually inspecting for organic material after cleaning and sanitizing equipment at preoperation and following midshift clean up. Verification procedures relied on swabbing of equipment surfaces for total plate counts. Efforts were made to assist with SOP development following the conclusion of this study. Finding contamination of cotton knit gloves, knives, and plastic lugs also resulted in plans to improve operational sanitation as part of GMPs. Sanitation supplies and equipment, including knee-operated hand-washing sinks, sanitizer boxes with heater units, boot dips, trash cans, stainless steel tubs, disposable and rubber aprons, white cotton gloves, rubber gloves, and sanitizing agents, were obtained. These supplies were located strategically in the facility prior to educational training sessions with plant personnel. One month following the installation of sanitation equipment, food-safety training sessions and implementation of the HACCP system, microbiological samples were collected to evaluate the effectiveness of the HACCP program.

### Evaluation following HACCP implementation

**Physical and chemical hazard evaluation.** Because pre-HACCP investigations eliminated physical and chemical hazards as CCPs for meat products produced at this facility, physical and chemical hazard analyses were not conducted during the post-HACCP evaluation.



**TABLE 2. Sample collection schedule using the swab method and catalase test for microbiological evaluation of meat-plant equipment before and during daily operations in a meat-processing facility after initiation of the HACCP system**

Microbiological sample collection site	Microbiological samples: collection periods and numbers							
	Swab method				Catalase method			
	Preprocessing		During processing		Preprocessing		During processing	
Period (days)	Samples (n)	Period (days)	Samples (n)	Period (days)	Samples (n)	Period (days)	Samples (n)	
Cotton knit gloves	0	0	5	19	0	0	5	19
Knives	5	5	4	12	5	5	4	12
Plastic lugs	0	0	5	19	0	0	5	19
Meat grinders	4	20	3	36	4	20	3	36
Patty maker	4	12	1	15	4	12	1	15

**Microbial hazard evaluation.** Meat plant equipment. Microbial samples were collected prior to and during daily meat-processing operations using the swab and catalase methods as previously described with slight modifications. A sterile template having an inside area of 25.81 cm<sup>2</sup>, rather than 103.23 cm<sup>2</sup>, was used to collect samples from knives. Also, 5 ml of sterile PB was used for the initial collection blank for the swab method and 3 ml of H<sub>2</sub>O<sub>2</sub> was used for the catalase test. The sample collection schedule using these two techniques and the number of samples collected are presented in Table 2. The contact method was not repeated because plant personnel planned to employ only swab techniques.

Because the meat-processing facility had been equipped with an incubator, all microbiological plating was conducted on site. Total aerobic, total coliform, and *E. coli* counts were determined in duplicate using Petrifilm as previously described for plating swab samples, except all plates were incubated at 35°C. Psychrotrophic counts were not determined due to unavailability of a 7°C incubator. Meat plant equipment was not sampled to detect pathogens during the post-HACCP evaluation.

**Microbial evaluation and pathogen detection in pork products.** Over a 5-day period, 5 pork-sausage samples and 5 pork chops were collected, sealed in stomacher bags, overwrapped with brown paper, and then stored in a -23°C freezer for 7 days. The samples subsequently were transported to KSU in an ice chest maintained at 4°C and stored at -19°C for 3 days. All samples were thawed in a refrigerator at 0 to 4°C for 12 h prior to analysis as previously described for beef products. For *S. aureus*, samples from the coagulated tubes were streaked onto Baird Parker agar plates (BP) and incubated aerobically for 24 h at 37°C. Typical black colonies on BP plates were loop-picked and inoculated into BHI broth, which was incubated aerobically at 37°C for 24 h. Following incubation, 0.5 ml of BHI suspension and 0.5 ml of BCP were combined and incubated aerobically at 37°C for 4 h. Samples with a 4+ coagulation were considered positive for *S. aureus* (10).

Fresh pork products also were evaluated for *E. coli* O157:H7. Using the pre-enriched BHI suspension prepared for post-HACCP pathogen detection, 0.2 ml was spread plated onto MacConkey sorbital agar (MSA)

(Oxoid, Basingstoke, Hampshire, England) plates and incubated aerobically at 37°C for 24 h. A swab sample was taken from the MSA plate, placed into 10 ml of LB with or without Novobiocin and incubated aerobically at 37°C for 24 h. LB suspensions were streaked onto eosin methylene blue (EMB) agar plates and onto MSA plates and incubated aerobically at 37°C for 24 h. EMB plates producing a metallic green sheen were suspected to contain *E. coli*, and further testing was conducted using an agglutination test. A loopful of typical colony was removed from MSA plates and mixed with Oxoid Diagnostic Reagents *E. coli* O157 antiserum. Samples were presumptive positive if agglutination and granulation occurred.

## RESULTS AND DISCUSSION

### Baseline evaluation prior to initiation of HACCP

In general, swabbing and plating on Petrifilm (Table 3) appeared to be a more sensitive method for collecting microbial samples than using the contact method, which detected aerobic organisms only on one item sampled (plastic lugs, 1.0 log CFU/cm<sup>2</sup>) and coliform counts on 3 items sampled (cutting tables, plastic lugs

**TABLE 3. Mean microbial colony counts from meat-plant equipment surfaces sampled using the swab method before and during daily operations in a meat-processing facility before and after initiation of the HACCP system**

Microbiological sample Collection site	log CFU/cm <sup>2a</sup> before and after initiation of HACCP system															
	Preprocessing								During processing							
	Aerobes		Coliforms		<i>E. coli</i>		Psychrotrophs		Aerobes		Coliforms		<i>E. coli</i>		Psychrotrophs	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Cotton knit gloves	<1.0	NM	<1.0	NM	<1.0	NM	<1.0	NM	3.0	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NM
Knives	2.6	<1.0	1.9	<1.0	<1.0	<1.0	<1.0	NM	1.2	<1.0	1.5	<1.0	<1.0	<1.0	<1.0	NM
Cutting tables	1.4	NM	<1.0	NM	<1.0	NM	<1.0	NM	1.1	NM	1.2	NM	<1.0	NM	1.2	NM
Plastic lugs	NM <sup>b</sup>	NM	NM	NM	NM	NM	NM	NM	4.6	1.0	3.9	<1.0	2.5	<1.0	1.1	NM
Band saw	<1.0	NM	1.6	NM	<1.0	NM	<1.0	NM	2.3	NM	<1.0	NM	<1.0	NM	<1.0	NM
Meat grinders	2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NM	2.0	1.1	1.7	<1.0	<1.0	<1.0	<1.0	NM
Pottery moker	3.7	<1.0	1.4	<1.0	1.6	<1.0	1.5	NM	4.4	2.0	1.1	<1.0	<1.0	<1.0	4.1	NM
Processing-room walls	NM	NM	NM	NM	NM	NM	NM	NM	<1.0	NM	<1.0	NM	<1.0	NM	<1.0	NM
Chill-room walls and shackles	NM	NM	NM	NM	NM	NM	NM	NM	1.6	NM	<1.0	NM	<1.0	NM	<1.0	NM

<sup>a</sup>Microbial contamination considered low if log CFU/cm<sup>2</sup> <1.0; intermediate, 1.0 to 2.5; high, 2.5 to 4.0; and extremely high, >4.0. (6)

<sup>b</sup>NM, not measured.

**TABLE 4. Mean catalase activity on meat-plant equipment surfaces sampled before and during daily operations in a meat-processing facility, before and after initiation of the HACCP system**

Sample collection site	Catalase activity <sup>a</sup>			
	Sampling prior to HACCP system initiation		Sampling after initiation of HACCP system	
	Preprocessing	During processing	Preprocessing	During processing
Cotton knit gloves	1.4	3.3	NM	2.0
Knives	1.5	2.8	1.0	1.8
Cutting tables	1.6	3.0	NM	NM
Plastic lugs	NM <sup>b</sup>	1.8	NM	1.8
Band saw	1.3	3.2	NM	NM
Meat grinders	2.2	3.0	1.0	2.1
Pottery moker	NM	NM	1.0	1.8
Processing-room walls	NM	1.0	NM	NM
Chill-room walls and shackles	NM	1.6	NM	NM

<sup>a</sup>Subjective scale, where 1, few bubbles, surface presumed to be relatively clean; 2, some bubbles; 3, many bubbles; and 4, excess bubbles, surface presumed to be unclean.

<sup>b</sup>NM, not measured.

and band saws: 1.1, 1.0, and 1.0 log CFU/cm<sup>2</sup> respectively). In contrast to the contact method, which required placing a RODAC plate directly on the contact surface, the swab technique allowed access to confined areas that tend to be more difficult to clean and sanitize. Although the catalase method did not directly measure the number of microbial colonies, it indicated the level of contamination. Catalase levels on equipment increased as equipment was used during processing, demonstrating the need for continual sanitation during processing operations (Table 4).

Overall, the cotton knit gloves, cutting tables, and the band saw had total aerobic counts of  $\leq 3.0$  log CFU/cm<sup>2</sup> (Table 3). During meat-processing operations, total aerobic counts on the cotton knit gloves and band saw increased, indicating that contamination occurred during routine processing activities. For knives, initial total aerobic and coliform counts were 2.6 and 1.9 log CFU/cm<sup>2</sup>, respectively, which decreased to 1.2 and 1.5 log CFU/cm<sup>2</sup> during processing (Table 3). It appeared that the knives had not been cleaned or sanitized adequately prior to use and may have served as sources of contamination. During processing operations, however, knives were sanitized periodically with a 200 ppm chlorine solution. This may have contributed to detecting lower microbial counts from the knives during processing operations.

Total coliform, *E. coli*, and psychrotrophic counts of the cotton knit gloves were initially  $< 1.0$  log CFU/cm<sup>2</sup> and did not increase as a result of meat-processing operations (Table 3). Total coliform and psychrotrophic counts increased slightly on the surface of the cutting tables during processing, but *E. coli* and psychrotrophic counts remained at  $< 1.0$  log CFU/cm<sup>2</sup> on the band saw during operation.

Although total aerobic counts did not change once grinding operations commenced, total coliform counts increased on the meat grinders (Table 3). Initial microbial counts could be reduced through improved cleaning and sanitation procedures. Because

coliforms are indicative of fecal contamination, slaughter procedures need to be improved to prevent carcass contamination. The USDA Food Safety Inspection Service has issued regulations stipulating that any foreign material present on a carcass must be trimmed, as was done in this plant, rather than washed off a carcass. Both *E. coli* and psychrotrophic counts were  $< 1.0$  log CFU/cm<sup>2</sup> before and during grinding operations (Table 3).

The patty maker had initial total aerobic and psychrotrophic counts of 3.7 and 1.5 log CFU/cm<sup>2</sup>, respectively, which increased to 4.4 and 4.1 log CFU/cm<sup>2</sup> during patty production (Table 3).

Plastic lugs were used to transport meat during production and to hold meat products. Although microbial samples were not collected from the plastic lugs prior to use, high total aerobic and coliform counts and *E. coli* counts detected during production (Table 3) indicated that the lugs could be a significant source of microbial contamination.

In general, microbial samples collected from processing and chill room walls and from trolleys during processing operations were  $< 1.0$  log CFU/cm<sup>2</sup> (Table 3). The total aerobic count obtained from the chill room walls was 1.6 log CFU/cm<sup>2</sup>. The walls in these rooms would not serve as a significant source of microbial contamination for meat products.

Analyses were performed to detect pathogens in samples collected from meat-plant equipment prior to commencing daily processing activities and during meat-processing operations. *S. aureus* was detected in 50% of the band saw samples, 30% of the knife samples, 11% of the cotton knit glove and meat-grinder samples, and 10% of the cutting-table samples that were collected prior to commencing daily processing activities. *S. aureus* was found in 50% of the cutting-table samples, 30% of the cotton knit glove samples, 20% of the plastic lug and processing wall samples, 11% of the meat-grinder samples, and 10% of the knife and chill room wall samples that were collected during meat-processing operations. *Salmonella* spp. and *C. per-*

*fringens* were not detected on the meat-plant equipment.

The mean total aerobic, total coliform, *E. coli*, and psychrotrophic counts were 5.4, 3.2, 2.9 and 2.9 log CFU/g for beef steak; 5.2, 3.6, 3.5 and 3.6 log CFU/g for beef brisket; 5.2, 3.7, 2.9 and 2.4 log CFU/g for beef tenderloin; and 5.3, 3.9, 3.8 and  $< 1.0$  log CFU/g for ground beef respectively. Because microbial counts were not obtained from raw beef materials prior to fabrication or processing into ground beef, conclusions cannot be made as to whether the microbial contamination was primarily due to high initial counts in the raw material, from contact with meat processing equipment, or from improper hygienic practices of meat plant personnel. *S. aureus* was detected in 20% of the ground beef and beef steak samples. *Salmonella* and *C. perfringens* were not detected in any of the beef products. In addition, antibiotics residues were not detected in any of the beef products using the Charm test.

These results indicated that the primary sources of microbial contamination were cotton knit gloves, knives, plastic lugs, meat grinders and the patty maker. To minimize microbiological hazards, CCPs were identified at the grinding and patty-making steps and preventative measures initiated. In addition, GMPs were improved.

#### Evaluation following HACCP implementation

Total aerobic counts from cotton knit gloves worn during processing operations were 1.0 log CFU/cm<sup>2</sup> (Table 3). By training personnel to change gloves frequently during processing, these counts were reduced compared to pre-HACCP results. Total coliform and *E. coli* counts were  $< 1.0$  log CFU/cm<sup>2</sup> on glove samples during processing operations.

Total aerobic, total coliform, and *E. coli* counts obtained from knife samples collected prior to and during daily meat-processing operations were  $< 1.0$  log CFU/cm<sup>2</sup> (Table 3). This represented a substantial reduction from microbial counts collected

prior to reemphasizing the importance of GMPs. Knife sanitizer boxes and improved procedures for cleaning and sanitizing equipment were primarily responsible for improving the sanitary condition of the knives.

Total aerobic counts obtained from sampling plastic lugs during processing operations were 1.0 log CFU/cm<sup>2</sup> (Table 3) after procedures were established to clean and sanitize the lugs periodically during processing operations in an effort to minimize cross-contamination. Total coliform and *E. coli* counts were <1.0 log CFU/cm<sup>2</sup> on plastic lugs during processing operations.

Compared to pre-HACCP results, total aerobic counts were reduced 1 log cycle on meat grinders that were properly cleaned and sanitized before use (Table 3). Total aerobic counts increased slightly to 1.1 log CFU/cm<sup>2</sup> once meat had passed through the grinders. An increase usually occurs because of contamination from meat. Total coliform and *E. coli* counts remained at <1.0 log CFU/cm<sup>2</sup> on the meat grinders after cleaning and sanitizing and during processing operations.

The patty maker had total aerobic, coliform, and *E. coli* counts of <1.0 log CFU/cm<sup>2</sup> prior to commencing daily meat-processing activities. This represented a 2-log-cycle reduction in aerobic counts compared to pre-HACCP implementation. Total aerobic counts from the patty maker increased to 2.0 log CFU/cm<sup>2</sup> during production of patties. This CCP was effectively controlled through procedures implemented with HACCP, mainly adequate cleaning and sanitation prior to start up, at midshift, and at the end of the production day. Total coliform and *E. coli* counts on the patty maker remained at <1.0 log CFU/cm<sup>2</sup> when sampled during processing operations.

In general, mean catalase activity indicated that meat-plant equipment surfaces tested were cleaner prior to commencing daily processing activities after implementation of HACCP than before HACCP implementation (Table 4). This same trend was observed on samples obtained from equipment surfaces during meat-processing operations.

When this study was initiated, beef and pork were slaughtered and processed at this facility. During the course of this study, beef-processing operations were discontinued because of economic conditions. For this reason, only pork products were available for microbial analyses after HACCP was implemented. Pork chops had lower total aerobic (3.3 versus 2.4 log CFU/g), coliform (2.3 versus <1.0 log CFU) and psychrotrophic (3.4 versus 2.8 log CFU/g) counts than pork sausage. Ground meat products generally have increased microbial counts compared to intact meat products, because the process of grinding increases product surface area and microbes are introduced to the product. *S. aureus* was detected in 60% of the pork chop samples and 100% of pork sausage samples. *Salmonella* spp., *E. coli* O157:H7 and *C. perfringens* were not detected in these products. Valid comparisons among pre- and post-HACCP products cannot be made because different types of products were monitored.

## CONCLUSIONS

Overall, the implementation of HACCP plans and improving GMPs reduced microbial contamination on the meat-plant equipment surfaces tested. For the HACCP plan to be successfully implemented, all personnel must undergo food-safety training and become involved in the program. The contact method which employed the use of RODAC plates was shown to be less effective for detecting contamination on equipment surfaces than the swab technique and plating on Petrifilm. The catalase test was demonstrated to be a quick and simple method to assess microbial contamination. The presence of *S. aureus* in a large percentage of finished meat products indicated that personnel needed to improve personal hygienic practices. Educational programs should be established to continually reinforce food-safety principles, especially when employee turnover is high.

## ACKNOWLEDGMENTS

Contribution no. 95-147-E, Kansas Agricultural Experiment Station, Manhattan, Kansas. The authors would like to thank Shaheen Nathani, Lei Zhao, and Jean Craig for their contribution to this work. Thanks also goes to Dennis Doman and Randy Knoll, State Meat Inspector Stan Deines, and all the employees that cooperated in this study. Appreciation is extended to Drs. Casey Frye and Daniel Fung for their support and to the Extension Service, United States Department of Agriculture for funding this study.

## REFERENCES

1. Al-Dagal, M., O. Mo, D. Y. C. Fung, and C. Kastner. 1992. A case study of the influence of microbial quality of air on product shelf life in a meat processing plant. Dairy, Food Environ. Sanit. 12:69-70.
2. Ali, M. S. and D. Y. C. Fung. 1991. Occurrence of *Clostridium perfringens* in ground beef and ground turkey evaluated by three methods. J. Food Safety 11:197-203.
3. Bauman, H. 1990. HACCP: concept, development, and application. Food Technol. 44(5):156-158.
4. Bean, N. H. and P. M. Griffin. 1990. Foodborne disease outbreaks in the United States, 1973-1987: Pathogens, vehicles, and trends. J. Food Prot. 53: 804-818.
5. Flowers, R. S., J.-Y. D'Aoust, W. H. Andrews, and J. S. Bailey. 1992. *Salmonella*. In (C. Vanderzant and D. F. Splittstoesser (eds.), Compendium of methods for the microbiological examination of foods, 3rd ed. pp. 371-422. American Public Health Association, Washington, D.C.
6. Fung, D. Y. C. 1986. Microbiology of meats. KSU Meat Safety Handbook. KSU Cooperative Extension Service, MF-792, April.
7. Hitchens, A. D., P. A. Hartman, and E. C. D. Todd. 1992. Coliforms—*Escherichia coli* and its toxins; p. 325-369. In (C. Vanderzant and D. F. Splittstoesser (ed.), Compendium of methods for the microbiological examination of foods, 3rd ed. American Public Health Association, Washington, D.C.
8. ICMSF. 1988. Microorganisms in foods. 4. Application of the hazard analysis critical control point (HACCP) system to ensure microbiological safety and quality. Blackwell Scientific Publications Ltd., London.



9. Jay, J. M. 1992. Modern food microbiology, p. 97-121. Van Nostrand Reinhold, New York.
10. Lancette, G.A. and S.R. Tatini. 1992. *Staphylococcus aureus*. p. 533-550. In (C. Vanderzant and D. F. Splittstoesser (ed.), Compendium of methods for the microbiological examination of foods, 3rd ed. American Public Health Association, Washington, D.C.
11. Mislivec, P. B., L. R. Beuchat, and M. A. Cousin. 1992. Yeasts and molds. p. 239-249. In (C. Vanderzant and D. F. Splittstoesser (ed.), Compendium of methods for the microbiological examination of foods, 3rd ed. American Public Health Association, Washington, D.C.
12. Nichols, J. 1991. HACCP for smaller plants, Meat Poul. 37:30-32.
13. Stauffer, J. E. 1988. Quality assurance of food: ingredients, processing and distribution. Food and Nutrition Press, Inc., Westport, CT.
14. Sveum, W. H., L. J. Moberg, R. A. Rude, and J. F. Frank. 1992. Microbiological monitoring of the food processing environment, p. 51-74. In (C. Vanderzant and D. F. Splittstoesser (ed.), Compendium of methods for the microbiological examination of foods, 3rd ed. American Public Health Association, Washington, D.C.
15. Swanson, K. M. J., F. F. Busta, E. H. Peterson, and M. G. Johnson. 1992. Colony count methods, p. 75-95. In (C. Vanderzant and D. F. Splittstoesser, (ed.), Compendium of methods for the microbiological examination of foods, 3rd ed., American Public Health Association, Washington, D.C.
16. Wang, G. I. J., and D. Y. C. Fung. 1986. Significance of bacterial catalase in food microbiology: a review, J. Food Safety 8:47-67.

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# Airborne Bacterial Contamination in Beef Slaughtering-Dressing Plants with Different Layouts

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## SUMMARY

This study determined total aerobic bacterial populations in aerosols at several locations in three beef slaughtering-dressing plants. One of the plants had a straight-line rail layout with a dividing wall between the hide-on and hide-off areas, while the layouts of the other two plants were serpentine throughout the slaughter room; however, one of the serpentine layout plants had a dividing wall between the hide-on and hide-off areas. In the hide-on area, viable airborne bacterial counts were in the range of 2.28 to 3.17 log colony-forming units (CFU)/0.028 m<sup>3</sup> of air in all three plants. The plant with a serpentine slaughter line and no dividing wall had counts in the range 1.66 to 2.45 log CFU/0.028 m<sup>3</sup> in the hide-off area. In the other two plants, counts in the hide-off area were in the range 0.52 to 2.08 log CFU/0.028 m<sup>3</sup>. These results indicated that a modified straight-line rail layout slaughterline and dividing walls were effective in reducing viable airborne microbiological populations in the hide-off areas.

## INTRODUCTION

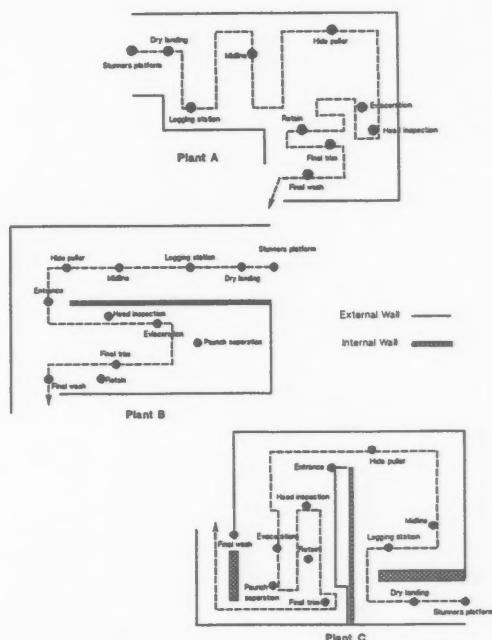
The importance of airborne contamination within a slaughter facility is twofold: the first concern is related to public health and the second consideration is related to reduced product quality and shelf life (4). Airborne microorganisms enter into, and exist within, a slaughter facility in basically three ways (9): (i) as "passengers" on solid particles of dust, skin, hair, and clothing; (ii) within droplets formed by the atomization of liquids by sneezing, spraying and splashing water, or steam from disinfecting units; and (iii) as isolated organisms resulting from evaporation of water from droplets. It is well accepted that the microorganisms found on the surfaces of animals, employees, and equipment that become airborne during slaughter could be an important source of meat contamination (6). Beef is of special interest because of the large microbial populations (10<sup>2</sup> to 10<sup>5</sup> viable bacteria per cm<sup>2</sup>) that may be present on a carcass surface (5).

Plant layout can influence air currents and airborne contamination of food products, including beef carcasses. *The General Report on Problems Found During European Economic Community Inspections of United States Fresh Bovine and Porcine Meat Establishments (3)* included, as a problem, the unsatisfactory separation between "clean" and "dirty" areas in United States slaughter facilities. Officials of the EU (European Union, formerly EC) favor a straight line for a rail layout for slaughtering-dressing (slaughterline) with waste water and airflow moving in the direction that is opposite to that of the movement of carcasses (2).

Two common ways to avoid or reduce the airborne transfer of microorganisms are (i) to build separating structures such as dividing walls between "clean" and "dirty" areas, or (ii) to separate "clean" from "dirty" areas in slaughtering and dressing operations by adequate distances. In most U.S. plants, distance is substituted for dividing walls, and *USDA Handbook 570 (10)* provides scales for original rail layouts for slaughtering-dressing (slaughterlines) from which estimated distances can be calculated. Automation of slaughterlines, a common practice in U.S. plants, results in spatial changes between operations. Spatial changes must not interfere with the orderly flow and clean handling of the product.

In general, the main sanitary principle in meat processing is that clean and dirty operations be effectively separated. This requires a well-designed plant layout which will protect the product from any external contamination or cross-contamination and should be a fundamental requirement in the development and application of hazard analysis critical control point (HACCP) food safety programs (7, 8). Al-Dagal et al. (1) concluded that air sampling in meat plants provides a useful tool for determining the presence of microorganisms in the environ-

Figure 1. Slaughterline rail layouts and comparable sampling sites of the three plants studied for airborne bacterial contamination.



ment. Evaluating the microbial content of the air spaces between operations may be a means of objectively determining or defining adequate separation.

The impact of airborne microorganisms, which can potentially become attached to beef carcasses along slaughterlines, on total microbiological load on beef carcasses is unknown. Data for the presence of airborne microorganisms in slaughter facilities is needed to assist in establishing guidelines for the determination of adequate separation between dirty and clean parts of the building and operations and to provide baseline data for establishing the HACCP system (7, 8).

The objective of this study was to determine total aerobic bacterial populations in aerosols at different locations in three beef slaughtering-dressing plants. More specifically, the study determined airborne bacterial numbers in a straight-line rail layout with a dividing wall between hide-on and hide-off areas and two layouts that were serpentine throughout the slaughter room; one of the plants with a serpentine

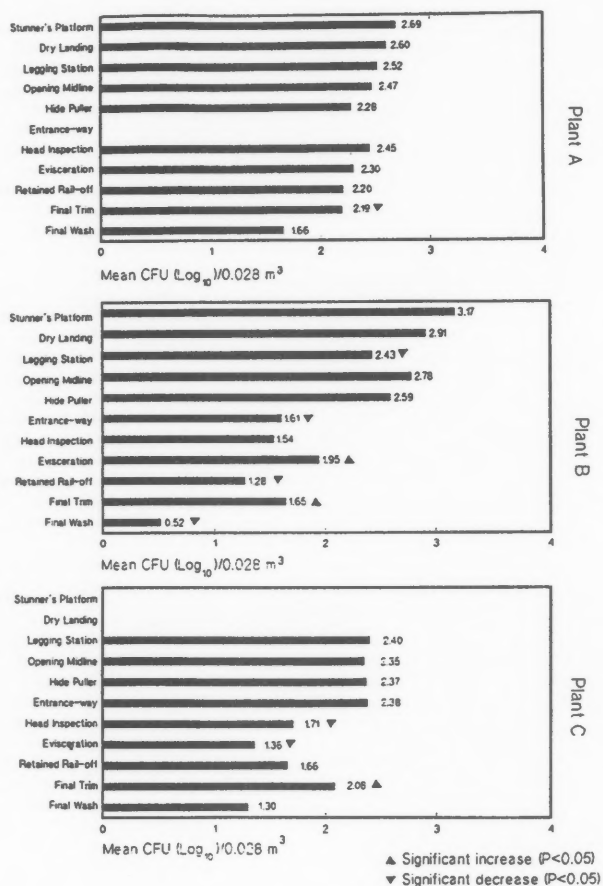
layout had a dividing wall between the hide-on and hide-off areas.

## MATERIALS AND METHODS

### Description of plants

Total airborne microbial contamination was determined in the three slaughtering-dressing plants during full production. Samples were taken twice at each plant for a period of 2 days during the months of September and October. Plant A was approximately 40 years old and slaughtered-dressed up to 360 bovine animals per hour. The slaughterline was serpentine and circled back upon itself throughout the slaughter room (Fig. 1). There was no dividing wall between the hide-on and hide-off working areas. Plant B, which had been remodeled within the previous 5 years, slaughtered-dressed up to 350 animals per hour. It had a modified straight-line rail layout with a dividing wall separating the hide-on and hide-off working areas. Plant C had been expanded in the previous five years; it

**Figure 2.** Mean log CFU/0.028 m<sup>3</sup> of air at different sampling sites in each of the three plants.



slaughtered/dressed 250 animals per hour; and it had a dividing wall separating the hide-on and hide-off areas and a dividing wall separating the stunning and bleeding area from the rest of the facility. The rail system in plant C was serpentine throughout the hide-off room. Cattle were slaughtered by using a continuous on-the-rail chain method in all three plants (Fig. 1).

#### Air sampling and testing

An Andersen (Andersen Samplers, Inc., Atlanta, GA) single-stage viable-particle sampler was used for collecting air samples. An in-line flow meter was installed at the sampler's vacuum hose connector in order to maintain a constant

air flow of 0.014 m<sup>3</sup>/min. A single-cylinder, piston-type, oil-free vacuum pump (Gast IHAB25, Benton Harbor, MI) was used as the vacuum source. The valve control located on the flow meter was calibrated while the vacuum pump operated at maximum capacity. The sampler was placed 1.2 to 2.0 meters from the carcasses as they traveled along the overhead rail, 0.5 to 1.5 meters above the floor. Three consecutive air samples were taken at each site during each day of sampling. The operating time for each sample was 2 min, in order to collect one cubic foot (0.028 m<sup>3</sup>) of air. The internal parts of the sampler were disinfected with ethyl alcohol between sampling sites. The orifices located on the

sampler's impactor stage required frequent cleaning with pressurized air.

Tryptic soy agar (TSA) plates (Difco Laboratories, Detroit, MI) were placed in the air sampler to recover the airborne microorganisms, which were counted after incubation at 35°C for 24 h. Microbial counts were converted to log colony forming units (CFU)/0.028 (m<sup>3</sup>) and analyzed statistically by an analysis of variance.

## RESULTS AND DISCUSSION

Plant B had numerically, though not statistically ( $P > 0.05$ ), higher aerobic plate counts at the stunner's platform than plant A (Fig. 2). The lower counts in plant A were probably due to the misting of the dorsal hide area (across the back) of the cattle, which was practiced only in plant A, just before they were dropped onto the dry landing belt. Misting of the cattle prior to removing the hide requires approval by the Food Safety and Inspection Service of the United States Department of Agriculture (FSIS-USDA). No testing was allowed at the stunner's platform or in the dry landing area of plant C because of plant management concerns about worker safety.

A comparison of airborne counts from hide-on and hide-off areas indicates that the plants with the highest decreases ( $P < 0.05$ ) in viable microbial populations were plants B (modified straight-line with a dividing wall between hide-on and hide-off areas) and C (serpentine line with a dividing wall). Plant A (serpentine line with no dividing wall) had similar counts in the hide-off area and the hide-on areas. The large decrease in airborne microbial counts between the hide-on and hide-off areas in plant B may be due in part to maintaining the hide-off room at a positive pressure (this pressure differential was created by pumping in filtered air, thus forcing the contaminated air into the less pressurized hide-on room).



Inspectors of the EU (3) identified as a major defect in U.S. plants unsatisfactory separation between "clean" and "dirty" areas in U.S. plants, which included the opening of the paunch in the same room where carcasses are present. The possibility of contaminating the carcasses with microorganisms made airborne during evisceration, viscera-handling, and paunch-opening processes, was considered a problem by EU inspectors. The hide-off areas that were most heavily contaminated with airborne microorganisms in plants A and C (serpentine and modified serpentine layouts) were those in which the dehided carcasses were present during viscera handling (Fig. 2). The most highly contaminated air in plant B (modified straight-line layout and dividing wall) was outside the path traveled by the dehided carcasses (Fig. 1 and 2) in the paunch separation area. Personal convenience fans used by workers and a large fan that forced air over the eviscerating table in plant A may be responsible for the large population of airborne microorganisms at the head inspection area of that plant (Fig. 2). At the final carcass-washing station, the air of plant B had the lowest bacterial counts in the entire study.

Based on the results of this study, it can be concluded that a modified straight-line rail layout (slaughterline) with a dividing wall between the hide-on and hide-off areas was effective in reducing viable airborne microorganisms population in the hide-off areas when positive air pressure was maintained in the slaughtering room. The results also indicated that the highest viable airborne populations in the hide-off area were coincident with, or were a result of, the eviscerating and/or paunch-opening processes. The requirement for a dividing wall between the hide-on and hide-off areas in beef slaughtering-dressing plants is justified by the results of the present study.

#### ACKNOWLEDGMENTS

This study was supported in part by the United States Meat Export Federation and by the Colorado Agricultural Experiment Station.

#### REFERENCES

1. Al-Dagal, M. O., F. Y. C. Fung, and C. Kastner. 1992. A case study of the influence of microbial quality of air on product shelf life in a meat processing plant. *Dairy Food and Environ. Sanit.* 12:69-70.
2. Commission of the European Communities. 1989. *Vade mecum* (EEC Commission Recommendation, 24 February). On the rules to be followed for inspections carried out in fresh meat establishments, (89/214/EEC). CEC, Brussels, Belgium.
3. Commission of the European Communities. 1990. *The General Report on Problems Found During EEC Inspections of U.S. Fresh Bovine and Porcine Meat Establishments*. Missions:1990. CEC, Brussels, Belgium.
4. Heldman, D. R. 1974. Factors influencing air-borne contamination of foods. *J. Food Sci.* 39:962-969.
5. International Committee on the Microbiological Specifications for Food. 1980. *Microbial ecology of foods*, vol. 2. Food commodities. Academic Press, Inc., London.
6. Kotula, A. W. and B. S. Emswiler-Rose. 1988. Airborne microorganisms in a pork processing establishment. *J. Food Prot.* 51:935-937.
7. Kukay, C. C., L. H. Holcomb, J. N. Sofos, J. B. Morgan, J. D. Tatum, R. P. Clayton, and G. C. Smith. 1996. Application of HACCP by small-scale and medium-scale meat processors. *Dairy Food Environ. Sanit.* 16:14-20.
8. Sofos, J. N. 1993. The HACCP system in meat processing and inspection in the United States. *Meat Focus Int.* 2(5):217-225.
9. Sullivan, J. J. 1979. Air microbiology and dairy processing. *Aust. J. Dairy Technol.* 34:133-138.
10. United States Department of Agriculture. 1984. *U.S. inspected meat and poultry packing plants: A guide to construction and layout*. USDA handbook 570. USDA, FSIS, Washington, D.C.

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# Federal Register

## **Beverages: Bottled Water; Correction**

**Agency:** Food and Drug Administration

**Action:** Final rule; correction.

**Summary:** FDA is correcting a final rule (FR 11/13/95) on bottle water. The document was published with some errors. This document corrects those errors.

## **Substances Approved for Use in the Preparation of Meat and Poultry Products**

**Agency:** Food and Drug Administration

**Action:** Proposed rule.

**Summary:** FDA is proposing to amend its regulations governing the review of petitions for the approval of food and color additives and substances generally recognized as safe (GRAS) to provide for joint review of

such petitions by the Food Safety and Inspection Service (FSIS), USDA, when meat or poultry product uses are proposed.

## **Food Standards of Identity, Quality and Fill of Container; Common or Usual Name Regulations**

**Agency:** Food and Drug Administration

**Action:** Advance notice of proposed rulemaking.

**Summary:** The FDA is announcing that it intends to review its regulations pertaining to identity, quality, and fill of container for standardized foods and its common or usual name regulations for nonstandardized foods. As part of this review, the agency is soliciting comments from all interested parties on whether these regulations should be retained, revised, or revoked. FDA solicits com-

ments on the benefits or lack of benefits of such regulations in facilitating domestic, as well as international, commerce on the value of these regulations to consumers. The agency also solicits comments on alternative means of accomplishing the statutory objective of food standards.

## **Peroxid-Chemie GMBH; Filing of Food Additive Petition**

**Agency:** Food and Drug Administration

**Action:** Notice.

**Summary:** The Food and Drug Administration (FDA) is announcing that Peroxid-Chemie GmbH has filed a petition proposing that the food additive regulations be amended to provide for the safe use of di (4-ethylbenzoyl) peroxide as an accelerator for silicone polymers and elastomers for use in contact with food.

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1974-Richard P. March  
1975-K. G. Weckel  
1976-Burdet H. Heinemann  
1977-Elmer H. Marth  
1978-James B. Smathers  
1979-Joseph Edmondson  
1980-James R. Welch  
1981-Francis F. Busta

In 1982 this award was split into the Educator Award and the Harold Barnum Award (for industry).

## EDUCATOR AWARD

1982-Floyd Bodyfelt  
1983-John Bruhn  
1984-R. Burt Maxcy  
1985-Lloyd B. Bullerman  
1986-Robert T. Marshall  
1987-David K. Bandler  
1988-Edmund A. Zottola  
1989-Vernal Packard  
1990-Michael Stiles  
1991-William E. Sandine  
1992-William S. LaGrange  
1993-Irving J. Pflug  
1994-Kenneth R. Swartzel  
1995-Robert B. Gravani  
1996-Cameron R. Hackney

## HAROLD BARNUM AWARD

1982-Howard Ferreira  
1983-C. Dee Clingman  
1984-Omer Majerus  
1985-William L. Arledge  
1986-Hugh C. Munns  
1987-J. H. Silliker  
1988-Kenneth Kirby  
1989-Lowell Allen  
1990-Roy Ginn  
1991-Thomas C. Everson  
1992-Ronald Case  
1993-David D. Fry  
1994-R. Bruce Tompkin  
1995-Damien A. Gabis  
1996-Dane T. Bernard

## CITATION AWARD

1951-J. H. Shrader and  
William B. Palmer  
(posthumously)  
1952-C. A. Abele  
1953-Clarence Weber  
1954-C. K. Johns  
1955-R. G. Ross

1956-K. G. Weckel  
1957-Fred C. Baselt  
1958-Milton R. Fisher  
1959-John D. Faulkner  
1960-Luther A. Black  
1961-Harold S. Adams  
1962-Franklin W. Barber  
1963-Merle P. Baker  
1964-W. K. Moseley  
1965-H. L. Thomasson  
1966-J. C. Olson, Jr.  
1967-William V. Hickey  
1968-A. Kelley Saunders  
1969-Karl K. Jones  
1970-Ivan E. Parkin  
1971-L. Wayne Brown  
1972-Ben Luce  
1973-Samuel O. Noles  
1974-John C. Schilling  
1975-A. R. Brazis  
1976-James Meany  
1977-None Given  
1978-Raymond A. Belknap  
1979-Harold E. Thompson, Jr.  
1980-Don Raffel  
1981-Henry V. Atherton  
1982-None Given  
1983-William B. Hasting  
1984-Elmer H. Marth  
1985-Ralston B. Read, Jr.  
1986-Cecil E. White  
1987-None Given  
1988-Carl Vanderzant  
1989-Clem Honer  
1990-None Given  
1991-Frank Bryan  
1992-Ewen C. D. Todd  
1993-Robert C. Tiffin  
1994-Sidney E. Barnard  
1995-Charles W. Felix  
1996-Joseph J. Disch

## SANITARIAN AWARD

1952-Paul Corash  
1953-E. F. Meyers  
1954-Kelley G. Vester  
1955-B. G. Tennent  
1956-John H. Fritz  
1957-Harold J. Barnum  
1958-Karl A. Mohr  
1959-William Kempa  
1960-James C. Barringer  
1961-Martin C. Donovan  
1962-Larry Gordon  
1963-R. L. Cooper  
1964-None Given

1965-Harold R. Irvin  
1966-Paris B. Boles  
1967-Roger L. Stephens  
1968-Roy T. Olson  
1969-W. R. McLean  
1970-None Given  
1971-Shelby Johnson  
1972-Ambrose P. Bell  
1973-None Given  
1974-Clarence K. Luchterhand  
1975-Samuel C. Rich  
1976-M. W. Jefferson  
1977-Harold Bengsch  
1978-Orlowe Osten  
1979-Bailus Walker, Jr.  
1980-John A. Baghott  
1981-Paul Pace  
1982-Edwin L. Ruppert  
1983-None Given  
1984-Harold Wainess  
1985-Harry Haverland  
1986-Jay Boosinger  
1987-Erwin P. Gadd  
1988-Kirmon Smith  
1989-Robert Gales  
1990-Leon Townsend  
1991-James I. Kennedy  
1992-Dick B. Whitehead  
1993-Lawrence Roth  
1994-Charles Price  
1995-Everett E. Johnson  
1996-Leon H. Jensen

## HONORARY LIFE MEMBERSHIP AWARD

1957-J. H. Shrader  
1958-H. Clifford Goslee  
1959-William H. Price  
1960-None Given  
1961-Sarah Vance Dugan  
1962-None Given  
1963-C. K. Johns and Harold Macy  
1964-C. B. and A. L. Shogren  
1965-Fred Basselt and Ivan Parkin  
1966-M. R. Fisher  
1967-C. A. Abele and L. A. Black  
1968-M. P. Baker and W. C. Frazier  
1969-John Faulkner  
1970-Harold J. Barnum  
1971-William V. Hickey  
1972-C. W. Dromgold and  
E. Wallenfeldt  
1973-Fred E. Uetz  
1974-H. L. Thomasson and  
K. G. Weckel



# & Past Presidents

1975-A. E. Parker  
1976-A. Bender Luce  
1977-Harold Heiskell  
1978-Karl K. Jones  
1979-Joseph C. Olson, Jr.  
1980-Alvin E. Tesdal and  
Laurence G. Harmon  
1981-Robert M. Parker  
1982-None Given  
1983-Orlowe Osten  
1984-Paul Elliker  
1985-Patrick J. Dolan,  
Franklin W. Barber and  
Clarence K. Luchterhand  
1986-John G. Collier  
1987-Elmer Marth and  
James Jezeski  
1988-Kenneth Whaley and  
Paul J. Pace  
1989-Earl Wright  
Vernon Cupps  
1990-Joseph E. Edmondson  
1991-Leon Townsend  
Dick B. Whitehead  
1992-A. Richard Brazis  
Harry Haverland  
1993-None Given  
1994-Ken Kirby  
1995-Lloyd B. Bullerman  
Robert T. Marshall  
1996-Richard C. Swanson

## **BLACK PEARL AWARD**

1994-HEB Company  
San Antonio, TX  
1995-Albertson's, Inc.  
Boise, ID  
1996-Silliker Group Laboratories, Inc.  
Homewood, IL

## **SHOGREN AWARD**

1972-Iowa Affiliate  
1973-Kentucky Affiliate  
1974-Washington Affiliate  
1975-Illinois Affiliate  
1976-Wisconsin Affiliate  
1977-Minnesota Affiliate  
1978-None Given  
1979-New York Affiliate  
1980-Pennsylvania Affiliate  
1981-Missouri Affiliate  
1982-South Dakota Affiliate  
1983-Washington Affiliate  
1984-None Given  
1985-Pennsylvania Affiliate  
1986-None Given

1987-New York Affiliate  
1988-Wisconsin Affiliate  
1989-Georgia Affiliate  
1990-Texas Affiliate  
1991-Georgia Affiliate  
1992-Georgia Affiliate  
1993-New York Affiliate  
1994-Illinois Affiliate  
1995-Wisconsin Affiliate  
1996-Wisconsin Affiliate

## **MEMBERSHIP ACHIEVEMENT AWARD**

1986-Iowa Affiliate  
1987-Florida Affiliate  
1988-Florida Affiliate  
1989-California Affiliate  
1990-California Affiliate  
1991-Illinois Affiliate  
1992-California Affiliate  
Illinois Affiliate  
1993-California Affiliate  
1994-California Affiliate  
1995-Texas Affiliate  
1996-California Affiliate

## **PAST PRESIDENTS**

1912-C. J. Steffen  
1913-C. J. Steffen  
1914-C. J. Steffen  
1915-A. N. Henderson  
1916-Claude F. Bessio  
1917-Wm. H. Price  
1918-Alfred W. Lombard  
1919-James O. Kelly  
1920-Ernest Kelly  
1921-C. L. Roadhouse  
1922-H. E. Bowman  
1923-Geo. E. Bolling  
1924-J. B. Hollingsworth  
1925-T. J. Strauch  
1926-G. C. Supplee  
1927-W. A. Shoults  
1928-Ira V. Hiscock  
1929-H. R. Estes  
1930-R. E. Irwin  
1931-A. R. B. Richmond  
1932-W. B. Palmer  
1933-H. N. Parker  
1934-P. F. Krueger  
1935-C. K. Johns  
1936-G. W. Grim  
1937-J. C. Hardenbergh  
1938-A. R. Tolland  
1939-V. M. Ehlers  
1940-P. D. Brooks

1941-L. C. Frank  
1942-F. W. Fabian  
1943-C. A. Abele  
1944-C. A. Abele  
1945-R. R. Palmer  
1946-R. R. Palmer  
1947-R. G. Ross  
1948-W. D. Tiedeman  
1949-A. W. Fuchs  
1950-M. R. Fisher  
1951-K. G. Weckel  
1952-H. L. Thomasson  
1953-H. J. Barnum  
1954-John D. Faulkner  
1955-I. E. Parkin  
1956-Harold S. Adams  
1957-Paul Corash  
1958-Harold Robinson  
1959-Franklin Barber  
1960-W. V. Hickey  
1961-John Sheuring  
1962-Charles E. Walton  
1963-Ray Belknap  
1964-John H. Fritz  
1965-W. C. Lawton  
1966-Fred E. Uetz  
1967-P. R. Elliker  
1968-A. N. Myhr  
1969-Samuel O. Noles  
1970-Milton E. Held  
1971-Dick B. Whitehead  
1972-Orlowe M. Osten  
1973-Walter F. Wilson  
1974-Earl O. Wright  
1975-P. J. Skulborstad  
1976-H. E. Thompson, Jr.  
1977-H. V. Atherton  
1978-David D. Fry  
1979-Howard Hutchings  
1980-Bill Kempa  
1981-William Arledge  
1982-Harry Haverland  
1983-Robert Marshall  
1984-A. Richard Brazis  
1985-Archie Holliday  
1986-Sidney E. Barnard  
1987-Roy Ginn  
1988-Leon Townsend  
1989-Robert Gravani  
1990-Ron Case  
1991-Bob Sanders  
1992-Damien A. Gabis  
1993-Michael P. Doyle  
1994-Harold Bengsch  
1995-C. Dee Clingman  
1996-F. Ann Draughton

# NewMembers

## CANADA

### ALBERTA

**Aqueel Athar**  
Norwest Labs, Calgary

**Connie Zagrosh-Miller**  
Alberta Agriculture, Edmonton

### ONTARIO

**Frances Campbell**  
Bright Cheese House, Woodstock

**Cindy Knight**  
3M Canada, Inc., London

**Vickie Therrien**  
Agriculture Canada, Nepean

## HONG KONG

**Sau Ha Yau**  
Cathay Pacific Catering

## KOREA

**Sung-Ho Lee**  
Seoul

## NEW ZEALAND

**Paul Cook**  
Alpha Biologicals, Pakuranga  
Auckland

## PUERTO RICO

**Miriam Meléndez Rivera**  
Indulac, Juana Diaz

## SWITZERLAND

**Peter Kradolfer**  
Federation of Migros Cooperatives  
Courtepin

## UNITED STATES

### ALABAMA

**G. M. Gallaspy**  
Alabama Dept. of Public Health  
Montgomery

### ALASKA

**Brian Himelbloom**  
University of Alaska, Kodiak

### CALIFORNIA

**Raul Cano**  
California Polytechnic State  
University, San Luis Obispo

**Francisco J. Espinucua**  
Los Angeles

**Laila Lam**  
Anresco, Inc., San Francisco

**Michi Matsuura**  
PE Applied Biosystems, Foster City

**David Paquette**  
American Institute of Baking  
Oceanside

**John Wiggins**  
Contra Costa Co., Moraga

### FLORIDA

**Chia-Min Lin**  
Gainesville

**Bob Wynne**  
Shaws Southern Belle, Jacksonville

### GEORGIA

**Michael C. Carakostas**  
The Coca-Cola Co., Atlanta

**Ma. Rocelle Clavero**  
University of Georgia, Griffin

**Sherri Murray**  
Country Home Bakers, Atlanta

**Mike Musgrove**  
USDA-ARS-RRC-PMSRU, Athens

### ILLINOIS

**Mary Lynam**  
Kraft Foods, Glenview

### INDIANA

**Armand Angeles**  
Fast Food Merchandisers  
Richmond

### IOWA

**Bonnie Humm**  
American Meat Protein Co., Inc.  
Ames

### MAINE

**Lloyd Hutchinson**  
Barber Foods, Portland

### MARYLAND

**H. Ray Gamble**  
USDA-ARS-PBEL, Beltsville

**Robert D. Weatherford, Jr.**  
McCormick & Co., Inc., Baltimore

### MASSACHUSETTS

**Richard D. Waskiewicz**  
Division of Food & Drugs, Jamaica  
Plain

### MICHIGAN

**Jim Draze**  
Kalamazoo Co. Human Services  
Nazareth

**Jon Grubich**  
Awrey Bakeries, Inc., Livonia

**Holly Mercer**  
Michigan Dept. of Agriculture  
Portland

**Patrick Mercer**  
Michigan Dept. of Agriculture  
Lansing

**Eric Newman**  
Nelson Products Co., Ann Arbor

## MINNESOTA

**Kathryn Lindberg**  
3M Company, St. Paul

**Robert L. Nelson**  
3M Company, St. Paul

**Maribeth Rasmussen**  
Cargill, Wayzata

**William Schafer**  
University of Minnesota, St. Paul

**Kevin J. Vought**  
Minnesota Dept. of Agriculture  
St. Paul

## MISSOURI

**Jodi Jurgens**  
Mid-America Dairymen, Inc.  
Springfield

## NEBRASKA

**Jennifer Graber**  
Lincoln

## NEW HAMPSHIRE

**John Haysted**  
Cleanrooms Magazine, Nashua

## NEW JERSEY

**Harold N. Feigenbaum**  
Degussa Corp., Allendale

**Brian Mayer**  
Campbell Soup Co., Camden

**Nandini Natrajan**  
N.C. State University, Mt. Laurel

## NEW YORK

**Paul Dersam**  
Upstate Milk Coop., LeRoy

**Helena Soedjak**  
Kraft Foods, Tarrytown

**Richard R. Vergili**  
Culinary Institute of America  
New Windsor

**Isabel Walls**  
Pepsi-Cola, Valhalla

**Henry Watanabe**  
Mitsubishi Eras Chemical America  
New York

## OHIO

**Tom Ward**  
Procter & Gamble, Cincinnati

## OKLAHOMA

**Al Serrano**  
City County Health Dept.  
Oklahoma City

**David Simmler**  
Tulsa

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**Carolyn Raab**  
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**Dawn Richter**  
Ore-Ida Foods, Ontario

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## UTAH

**Tim Lane**  
Hill Airforce Base

## WASHINGTON

**Janet Anderberg**  
Washington State Dept. of Health  
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**Karen Johnson**  
WSDA, Olympia

**Michele Maddox**  
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District, Olalla

**Ed North**  
Bremerton-Kitsap County Health  
Bremerton

**Cathy Smith**  
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**Susan Sorg**  
WSDA, Olympia

**Takao Yoshida**  
JTC International, Bellevue

## WASHINGTON, D.C.

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**Hilde Kruse**  
USDA-FSIS, Washington

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**Nan Faith**  
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Food Research Institute, Madison

# UpDates

## Unipath Quality System Achieves ISO 9001 Registration

Unipath Limited has been awarded registration to the internationally recognized quality standard ISO 9001, for the research, development and manufacture of Oxoid products at the Basingstoke, England, site.

In 1990, Unipath became the first culture media manufacturer in the world to be ISO 9002 registered. Certification to ISO 9001 follows expansion of the quality system to include research and development. This special emphasis endorses Unipath's commitment to the development of high quality, innovative products, building on the existing high standards of the research and development teams.

ISO 9001 requires a comprehensive model of design control. Research and development must be planned and documented at every step.

## SRC Vision and Pulsarr Join to Create Largest Worldwide Manufacturer of Machine Vision Sorting Systems

Two of the leading companies in machine vision sorting systems have joined forces. Netherlands-based Pulsarr joined with SRC VISION, Inc. of Medford, OR in March to create the largest worldwide organization specializing in quality control automated machine vision sorting and defect removal equipment.

Both companies experienced greater than 50% sales growth in 1995, and combined have over 900 machine vision systems installed worldwide.

Technologies within the group include sophisticated black and white and color camera technology; optics; X-ray imaging; proprietary illumination techniques including UV, IR, and laser; and advanced computer processors and vision software.

Jan Scholt, president of Pulsarr, said "The combination of technologies and industry experience of SRC VISION and Pulsarr is a clear example of how the sum is greater than both parts. There will be more new products, applications and technical expertise. And customers will benefit from the intensive worldwide knowledge of machine vision that will improve products, performance, customer service and cost-effectiveness."

## Dahlke Elected DFISA Chairman—Sherrill, Chairman-Elect

James S. Dahlke, President, Medalist Industries, Inc., was named Chairman of the Board of the Dairy and Food Industries Supply Association (DFISA), at the Association's Annual Conference held at the Loew's Coronado Bay Resort. As Chairman, Dahlke will preside over the 23-member Board of Directors.

Dahlke, actively involved on DFISA committees for more than fifteen years, has served on the Association's Board of Directors, the DFISA Foundation Board of Directors, and the International Trade, Marketing, Exposition Floor,

Executive and Special Awards Committees.

Also elected at the Conference was DFISA's new Chairman-Elect, John R. Sherrill, who has been President of M. G. Newell for the past eleven years. Involved in this industry since 1968, he has represented Distribution & Transportation members on DFISA's Board of Directors since 1992, and he completed a term as President of Food Industry Suppliers Association (FISA) in 1995, where he was elected Vice President in 1991.

In addition to the Chairman-Elect selection this year, there were only four Director openings. Three At Large Directors were elected from a field of six candidates. Each of the following people will serve a 3-year term: Beth Kloos, The Haynes Manufacturing Company, Westlake, OH; Steve Lefevre, King Engineering Corporation, Ann Arbor, MI; and John Nelson, Nelson Jameson, Inc., Marshfield, WI.

One Commodity Director slot representing ingredient supplier members was also open and filled by Bruce Poulterer, Germantown (USA) Company, Broomall, PA.

## Foodmaker, Inc. Announces New Executive Vice President

Foodmaker, Inc., owner and franchiser of Jack in the Box® restaurants announced the promotion of Kenneth R. Williams, to Executive Vice President from his previous position as Senior Vice President. Williams will retain his position as Executive Vice President of Marketing and Operations for Jack in the Box restaurants.

Williams is responsible for the marketing direction of Jack in the Box and the operations of all company-owned and franchised restaurants. Under his leadership, the Jack in the Box marketing team launched the award-winning "Jack's Back" campaign in early 1995, featuring the return of "Jack" as the company's founder and spokesperson, as well as many new product introductions and price promotions.

Williams has been involved in Jack in the Box operations since 1966 and has held a variety of positions with the company, including restaurant manager, regional manager, corporate vice president of operations and senior vice president. Prior to joining Foodmaker, he was an engineer for Pacific Telephone.

Williams holds a bachelor's degree in engineering from the University of Pennsylvania and a master's degree in business administration from the University of California, Los Angeles.

### **Daniel A. Nalipinski Joins Sparta as Director of Sales & Marketing**

Sparta Brush Company, Division of Carlisle Companies of Syracuse, NY has announced the appointment of Daniel A Nalipinski as Director of Sales & Marketing.

Nalipinski brings some 30 years of broad industry experience to Sparta. He joins Sparta Brush from Rubbermaid where he was Regional Vice President of the Commercial Products Division. Prior to that he spent 26 years in sales and sales management in the Home and Commercial Care Division of 3M Company.

Sparta Brush Company is a leading manufacturer of specialty brushes used in the food processing, food service, dairy, janitorial and recreational marine industries.

### **G&H Appoints New National Sales Manager**

David Zonca has accepted the position of National Sales Manager at G&H Products Corp. He will be responsible for all aspects of G&H's sales efforts, including managing the Distribution Network and the District Sales Managers.

Dave brings 15 years of experience in sales and sales management to G&H, 12 of which were in the sanitary process industry mainly with Cherry-Burrell Process Equipment Company. He has been involved in the sales of both process equipment and engineered systems to the food, beverage, dairy, cosmetic, and biopharmaceutical industries. His experience within a distributor organization includes

the start-up of a new regional engineering and sales office. Dave will relocate to Northern Illinois.

G&H Products Corp. is a full-line supplier of the most advanced stainless steel pumps, valves, and measuring and control equipment. State of the art technology is used to develop our broad range of high quality equipment. G&H is a part of the worldwide market leader, the LKM Group, a division of Alfa Laval.

### **Fearn Appointed Tri-Clover Marketing Manager**

The appointment of John Fearn as marketing manager has been announced by Tri-Clover Inc.

In his new capacity, Fearn will direct the marketing and advertising programs for the company's newly formed Food & Dairy, Bio-Pharm and Export Divisions. He will also work with the Tri-Clover Team 2000 organization which links the manufacturer in service to the customer.

Fearn joins Tri-Clover from Tetra Pak, Florida, where he served as new business development manager for the citrus industry. He joined the Alfa Laval group in 1974.

Tri-Clover Inc. is a leading manufacturer of sanitary stainless steel valves, pumps and fittings, as well as automated flow control and Clean-In-Place systems.

## Finalization on AFFI's Petition Urged so Consumers will Know that Frozen Products are as "Healthy," if not More so, than Fresh

**T**he American Frozen Food Institute (AFFI) urged the Food and Drug Administration (FDA) to take final action on AFFI's petition that would allow frozen fruits and vegetables, both single ingredient and mixed single ingredient, to bear the term "healthy" on the labels of those products.

In comments submitted to the agency, AFFI advocated prompt finalization of an FDA proposal published in February in response to an AFFI petition submitted to the agency in 1994 that would exempt frozen fruits and vegetables which cannot meet the agency's 10 percent nutrient contribution requirement for use of the term "healthy" on packaging. The 10 percent rule requires at least a 10 percent contribution of vitamin A, vitamin C, iron, calcium, dietary fiber, and protein to make a "healthy" claim.

In 1994, FDA stated that the claim could be used on raw fruits and vegetables that do not meet the nutrient contribution requirement, but that meet all other aspects of the definition. FDA took this action because it stated that raw fruits and vegetables can contribute significantly to a healthy diet and to achieving compliance with dietary guidelines. AFFI's petition argued that precluding use of the term "healthy" on frozen fruits and vegetables while permitting use of the term on raw product implied a distinction that does not exist.

"As the agency acknowledges, the data submitted by AFFI confirm that frozen fruits and vegetables are comparable, if not superior to, raw fruits and vegetables in terms of nutritional value and may be used interchangeably in structuring a healthy diet," AFFI said.

AFFI told FDA that its proposal represents only a first step in



# NEWS

resolving the anomalies created by this requirement. Since there may be other categories of products that are consistent with dietary guidance but are prohibited from bearing a "healthy" claim as a result of the 10 percent requirement, AFFI urged FDA to consider whether further exemptions may be appropriate.

AFFI emphasized to FDA the frozen food industry's commitment to providing healthful products to consumers. Members of the frozen food industry "have been leaders in the development of healthful food products and regard the food label as an important means of conveying the nutritional benefits of their products to consumers," AFFI said.

## Those Wholesome "Natural" Meals Could Prove Deadly

**S**o-called "natural" foods may contain dangerous toxins ranging from cyanide to cancer-causing agents, a leading nutrition scientist told the Biochemical Society's meeting in April.

"The term 'natural' is often used to convey a sense of wholesomeness and goodness" said Professor Tom Sanders, of King's College, London. "However, such a view is simplistic as many plants contain toxic compounds such as

cyanide and alkaloids that can adversely affect health. Furthermore, grains and nuts are particularly prone to contamination by mycotoxins that are potent carcinogens."

Cyanide intoxication in food was rare in developed countries, he said, although the occasional fatal case had occurred in health food enthusiasts consuming apricot kernels. Enthusiasts for a particular food were a special group that deserved attention. Several edible fungi contained hydrazine derivatives that are potentially carcinogenic. While the average intake might pose a small hazard to health, the risk would be much greater for extreme use by consumers.

Professor Sanders said contamination of nuts, legumes, and grains contributed to liver damage and probably liver cancer in Asia. Other "natural" foods also had health effects, for instance, licorice lovers risked sharply raised blood pressure; some legumes were naturally so full of hormones they caused feminisation in farm animals; peanuts could cause severe anaphylactic reactions in some people; and red wine could trigger migraine attacks in susceptible people.

## 3M and RCR Scientific, Inc., Sign Agreement for Pectin Gel Testing Products

**3**M and RCR Scientific, Inc., announced that they have signed an agreement for 3M Microbiology to acquire the Redigel and ColiChrome microbiological detection and growth media for the food and beverage industry. Specific terms of the agreement were not disclosed.

3M Microbiology will provide customer service support to existing customers in May and begin marketing Redigel and ColiChrome pectin gel testing products for the food and beverage industry in June, 1996. 3M will sell



these products directly to U.S. and Canadian customers.

3M Microbiology provides a range of Petrifilm plate products that provide time and labor savings compared to agar pour plate testing methods. These include microbial testing for aerobic, coliform, *E. coli*, and yeast and mold counts.

## Thousands of U.S. Food Related Deaths Preventable Through Expanded Use of Safe Technologies

**A**ccording to a report just released by the Council for Agricultural Science and Technology (CAST), a consortium of 30 scientific and professional societies, foodborne bacteria cause as many as 9,000 deaths in the United States annually; yet scientifically proven safe, low doses of pasteurizing radiation can kill over 99% percent of most foodborne bacteria.

The report was written and reviewed by more than a dozen scientists from public and private agencies, academia, and industry, who concluded that radiation pasteurization safely controls foodborne pathogens on beef, pork, lamb, and seafood. It therefore can protect consumers from such potentially devastating diseases as salmonellosis, hemorrhagic diarrhea caused by *Escherichia coli* O157:H7, and certain types of gastroenteritis.

In fact, "the safety and effectiveness of irradiation pasteurization is attested to by a broad spectrum of authorities," adds report co-chair Dr. Donald W. Thayer of the Food Safety Research Unit of the Eastern Regional Research Center, U.S. Department of Agriculture-Agricultural Research Service. In addition to the USDA, the U.S. Food and Drug Administration, the World Health Organization, the Codex Alimentarius Commission, the American Medical Association, the American Dietetic

Association, and the health authorities of approximately 40 countries all endorse the practice.

### The Problem of Foodborne Illness

Although largely preventable, foodborne illness remains a serious problem in the United States. Foodborne diseases caused by pathogenic bacteria may cause as many as 9,000 deaths each year and 6.5 million to 33 million cases of diarrheal disease. The annual economic losses associated with foodborne disease in the United States may be as large as \$5 billion or \$6 billion.

Thayer states that "recent outbreaks of disease caused by *Escherichia coli* O157:H7 in hamburger, particularly in the Northwest, where there were more than 700 cases and four deaths from a single outbreak, point to how serious the foodborne disease problem is. That strain of *E. coli* alone still causes some 8,000 to 20,000 cases of disease every year in the U.S."

### Safety, Healthfulness Proven

"What consumers may not understand is that while food is being irradiated, it's never in contact with radioactive material," says report co-chair Dr. Edward Josephson of the Food Science and Nutrition Research Center of the University of Rhode Island. "And, contrary to what some may have been told, the gamma rays, x-rays, or electrons used to treat it can't make it radioactive."

It is the rapidly growing cells of insects or spoilage and pathogenic bacteria that are killed when food is irradiated. There is little effect on the food itself because its cells are not multiplying. Longterm animal studies have demonstrated that irradiated foods are completely safe and that their nutritional value remains essentially unaltered.

### Product Acceptance

Josephson also points to the "widespread misconception that U.S. consumers will not accept irradiated food. But attitude studies and market tests show the contrary.

For instance, when consumers are provided factual information about products and a choice between irradiated and nonirradiated food, they'll pay premiums for irradiated poultry and pork."

### Current Uses

To control for the disease trichinosis, both the FDA and the USDA's Food Safety and Inspection Service approved in 1986 the irradiation of fresh or previously frozen pork. Regulations permitting poultry irradiation to control foodborne pathogens were approved by the FDA in 1990 and by the FSIS in 1992.

Irradiation has been demonstrated to control *Salmonella*, *Shigella*, *Staphylococcus aureus*, enteropathogenic *Escherichia coli*, *Vibrio cholerae*, *Vibrio parahaemolyticus*, *Vibrio vulnificus*, and hepatitis A virus, all of which have been associated with fish and shellfish. *V. vulnificus* in undercooked oysters, for instance, may cause gastroenteritis or septicemia, which has a mortality rate exceeding 50%.

U.S. fruits such as strawberries and papaya, and vegetables also are being treated with ionizing radiation to eliminate insects and spoilage organisms, to prevent overripening, and in the case of tubers and bulbs, sprouting. Irradiation of tomatoes not only extends their shelf-life but also allows them to be harvested when fully ripe, improving flavor.

### Future Uses

It is unlikely that all meat and poultry products would be treated with ionizing radiation; rather, irradiated meat and poultry likely would be chosen by customers who desire or require a greater degree of food safety, and by food service establishments to protect children and others at high risk from foodborne pathogens.

### Limits of Radiation Pasteurization

The potential for consumer infection by pathogens is decreased greatly and shelf life extended by radiation pasteurization of meat and

poultry. This benefit can be achieved only in products that are packaged and of the highest quality before being irradiated.

Radiation pasteurized products are neither sterile nor shelf stable and must be properly refrigerated, cooked, and served. The practice serves as one of the processor's last quality-control steps, assuring both the processor and the consumer of product safety.

### **Salmonella Typhi – Evidence of Increasing Antibiotic Resistance**

**S**trains of *Salmonella typhi* resistant to multiple antibiotics have been reported from Asia, Africa, and Latin America with increasing frequency. One-fourth to two-thirds of American patients with typhoid fever acquire their infection through foreign travel. Infections with resistant strains pose a challenge to patients and their physicians. There are currently no surveillance data on the frequency of drug-resistant *S. typhi*. In order to determine the patterns of resistance in the United States, and in the countries to which Americans travel, the CDC is requesting that all *S. typhi* specimens be sent to them for antibiotic sensitivity testing. Patient data which are routinely obtained on typhoid fever patients will be linked to the testing results.

Typhoid fever has become a rare illness in the United States due in large part, to consistently effective sanitation practices. Since the 1960's there have been 250 to 500 acute *Salmonella typhi* infections reported in the U.S. each year. Mississippi had three acute cases reported in 1992, two apparently acquired from chronic carriers, and one associated with foreign travel (Southeast Asia). Although none have been reported since that year, it should be consid-

ered in persons with typical symptoms who have travelled recently to less well developed countries.

Typhoid fever is characterized by the insidious onset of sustained fever, severe headache, malaise, anorexia, a relative bradycardia, splenomegaly, rose spots on the trunk in 25% of white patients, nonproductive cough in the early stages of the illness, and, in adults, constipation more commonly than diarrhea. Two to 5% of patients with acute typhoid fever become permanent carriers. Diagnosis is through culture of the blood early in the disease, and from urine and feces after the first week: bone marrow culture may also provide confirmation. Serologic tests are of little diagnostic value.

*\*Reprinted from the Mississippi Morbidity Report, Vol. 14, No. 9.*

### **Two Year Report on BST**

**F**DA approved Monsanto Company's recombinant bovine somatotropin (rbST) product, Posilac®, in November 1993 after a comprehensive review of the product's safety and efficacy, including human food safety. Posilac® is the only rbST product approved for increasing milk production in dairy cattle. The product has been commercially available since February 4, 1994.

During the first year of commercial use of Posilac®, a total of 806 reports of adverse effects were reported to Monsanto and submitted to FDA.

During a 24-month period, FDA received 1438 adverse experience reports. It is important to note that a report of an adverse effect in relation to a drug does not itself establish that the effect was caused by the drug. FDA believes that 918 of the 1438 reports were possibly associated with the use of Posilac®,

and that the other 520 reports were not related to treatment with Posilac®. Also, the reported clinical manifestations are known to occur in dairy cattle not supplemented with Posilac®.

Of the 918 reports possibly related to the use of Posilac®, 208 included mastitis, 185 included reproductive events, 165 involved increased somatic cell counts, 157 involved digestive disorders, 154 included swelling of the udder or abnormal milk, 150 included injection site reactions, and 113 included foot or leg problems. In some cases, a single report contained multiple conditions.

FDA encourages dairy farmers and veterinarians to report all adverse reactions associated with the use of rbST. They may report such reactions to Monsanto, to FDA through their veterinarian, or directly to FDA's Center for Veterinary Medicine. CVM accepts collect calls during working hours, and an answering machine is available to record after-hours calls. The telephone numbers are (301) 594-1751 for collect calls during working hours, and (301) 594-1722 to leave a message on evenings and weekends.

### **USDA Proposes Switch to Performance Standards**

**U**SDA's Food Safety and Inspection Service proposed on May 2, 1996 a shift in current regulations for the production of certain cooked beef and poultry products. Current regulations prescribe the means for producing safe products. With the proposed change, FSIS would specify the end to be achieved – as performance standards – rather than the means to reach the end. The standards would require the production of safe meat and poultry products. FSIS would maintain all

command-and-control provisions as examples of steps to achieve the performance standards. "Establishments would not be required to change any current practices in response to this proposed rule," the agency said. Products covered under the proposed rule include cooked beef, roast beef, and cooked corned beef; fully cooked, partially cooked, and char-marked uncured meat patties; and certain fully and partially cooked poultry products.

For a copy of the Federal Register notice, contact Science Communications. We will also send a copy of the FSIS proposal to eliminate prior approval requirements for facility blueprints, equipment, and certain quality control programs.

Taylor, M.R. 1996. Performance standards for production of certain meat and poultry products. Fed. Reg., 61(86): 19564-78. #96.093.

### **EPA Calls for Monitoring of Cryptosporidium in Water Supply**

**I**n early 1997, EPA will begin an 18-month monitoring program of certain public drinking water systems to gather information on Cryptosporidium and on the disinfectants used to kill

other waterborne microbes. The data collection program will assist EPA in setting standards for Cryptosporidium in public water systems and in assessing the risks of disinfectant by-products, such as chlorine. EPA will monitor water systems that serve over 100,000 people and draw upon surface waters as their source "to develop information on how often Cryptosporidium enters the water supply, sources of the Cryptosporidium, and the effectiveness of various treatment techniques," said EPA in a May 2, 1996 news release.

### **Greenpeace: No Safe Dose of Dioxin**

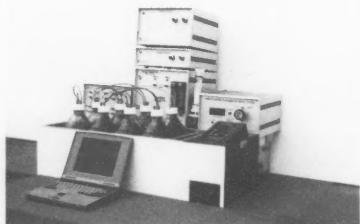
**A** Greenpeace report, released in April, calls for the elimination of vinyl plastics to halt the release into the environment of the PVC by-product dioxin and PVC softening agents called phthalates. Both substances interfere with human and animal hormone systems, the group said in an April 25 news release. Interference from minuscule environmental levels of dioxins and phthalates can damage developing embryos, Greenpeace said. "It is therefore not possible to calculate a 'safe' dose," the group said. "A regulatory policy based on risk assessment will not work."

The full report, "Taking back our stolen future: Hormone disruption and PVC plastic," is available from Greenpeace UK, Canonbury Villas, London N1 2PN; Telephone: 0171 354 5100; Fax: 0171 696

### **Mites and Scrapie**

**A** U.S. researcher speculated in an April 19, 1996 *Reuters* article that hay mites may carry the infective agent for transmissible spongiform encephalopathy. The researcher made the statement after testing the infectivity of mites from scrapie-infected farms. Publishing in a recent issue of *Lancet*, researchers injected ground mites into the brains of over 70 mice. Mites were taken from farms in Iceland with scrapie-infected sheep and from farms with healthy sheep. Of the mice receiving infective injections, 10 later showed the sponge-like holes associated with spongiform encephalopathy, *Reuters* said. "Findings may explain why Icelandic farms found that healthy sheep reintroduced into barns and fields where there was a scrapie outbreak up to five years before have also become sick," *Reuters* said. The sheep may have either ingested mites or scratched mites into their skin.

# IndustryProducts



Columbus Instruments, Inc.

## Compost Respirometer Tests Biodegradation of Plastics

Columbus Instruments new Compost Respirometer makes it easy to determine aerobic biodegradation of plastic materials under controlled composting conditions in the laboratory. Measurements conform to ASTM standard: D 5338-92 which requires that the test substances are exposed to inoculum that is derived from compost from municipal solid waste and that the composting takes place in an environment where temperature, aeration and humidity are closely monitored and controlled. The Compost Respirometer does not trap CO<sub>2</sub> and therefore no chemical agents such as Barium Hydroxide are involved in measurements. The Compost Respirometer operates under open air flow (open circuit) condition when fresh air is supplied to each compost chamber at a small, but constant, rate. Both oxygen and CO<sub>2</sub> are measured with O<sub>2</sub> precision gas analyzers having 0.001% resolution and computations on mg of CO<sub>2</sub> produced and mg of O<sub>2</sub> consumed are done by computer on an hourly basis.

The Compost Respirometer can simultaneously monitor 1 to 80 compost samples that can be as small as a few hundred grams

which conforms to the ASTM standard. With optional additional gas sensors, Columbus Instruments' Compost Respirometer can measure consumption or production of other gases such as CO, CH<sub>4</sub>, H<sub>2</sub>S, H<sub>2</sub>, and NH<sub>3</sub> involved in anaerobic or aerobic processes. Columbus Instruments' Compost Respirometer is an ideal instrument for measuring gas exchanges during slow biodegradation of plastics, detergents, oils, creosote, explosives, etc. Other applications include toxicity testing using bacteria cultures. Measurements are fully computerized and experiments can last from a few minutes to a few months. During an experiment the user can display in graphical form a history of the biodegradation process for each measured sample.

Columbus Instruments, Columbus, OH

Reader Service No. 345

## Lightning™ Cleaning Validation System

IDEXX Laboratories, Inc. announces the LIGHTNING INDEX™ Proficiency Program created to enhance the capabilities of the LIGHTNING™ System. The Proficiency Program will provide LIGHTNING customers with analysis of testing data as well as comparisons of their performance with other companies within their industry and the food industry as a whole. This innovative program is provided free of charge to LIGHTNING users in the United States and Canada.

The LIGHTNING INDEX Proficiency Program enables food processors to track and analyze testing data over time by sending

monthly results into IDEXX Laboratories. Each user receives an individually prepared comparison of plant results versus the average of data submitted by other LIGHTNING users in their chosen industry segments. The overall results for each industry segment are analyzed to allow an immediate comparison between one plant's cleaning effectiveness and industry performance.

The LIGHTNING Index Proficiency Program is designed to be flexible. Custom analyses of other variables, including type of cleaning crew, surface type, or cleaning product are also available. Additional reports for ATP control values will track trends or shifts in the LIGHTNING System functionality. All customer data has a unique and confidential identifier code.

The LIGHTNING INDEX Proficiency Program is an integral part of an overall cleaning validation system provided by IDEXX to aid in improving and documenting sanitation procedures at food processing plants.

IDEXX Laboratories, Inc., Westbrook, MA

Reader Service No. 346

## Profile™-1

New Horizons Diagnostics (NHD) announces the release of the Profile™-1 System for rapid detection of low levels of bacterial contaminants by the measurement of light emission (luminescence) resulting from an associated reaction. The system, which is commercially available as a general bacteria screen for food and surface monitoring, consists of a Model 3550 luminometer, reagents and disposables. The Profile™-1 is the

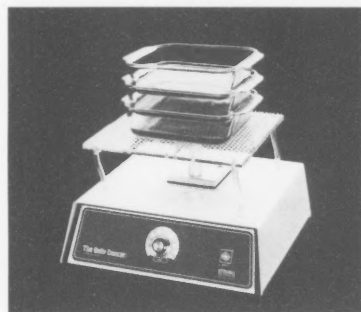


only luminescence based system validated by the USDA as a rapid and accurate method that correlates to total plate counts. The USDA's validation is the result of over a year's worth of testing on over 400 beef and 300 pork products. It is now possible to gain results similar to a 48 hour culture in less than 5 minutes.

The Profile™-1 is able to perform total ATP counts and bacterial ATP counts and can detect as few as 10<sup>3</sup> microorganisms. The reagents added allow for the lysing of specific cells that permit the detection of bacteria while removing inhibitors such as salts, detergents and heavy metals by utilizing a special filtration device called a Filtravette™.

New Horizons Diagnostics,  
Columbia, MD

Reader Service No. 347



Sigma Chemical Co.

## Specialized Shaker Features Unique Undulating Motion

A patented laboratory shaker which provides both horizontal and vertical orbital motion is now available from Sigma Chemical Company. Designed to provide optimal movement for the multiple stainings and washings involved in gel and blotting techniques, The Belly Dancer™ Shaker provides smoother, gentler, and more efficient agitation than ordinary orbital shakers. Agitation speed and

platform pitch may be varied from 0 to 125 RPM and 0 to 12 degrees respectively.

Compact and lightweight, The Belly Dancer™ can be used in a wide range of environments, including cold rooms and incubators. The unit requires just over 136 sq. ft. of bench space, weighs only 16 pounds, and will operate in ambient temperatures from 0° to 40°C. Its 12 x 12 inch open-sided platform accommodates oversize containers and supports loads up to 20 pounds. The Belly Dancer™ is available for either 110/115 VAC, 50/60 Hz or 220/240 VAC, 50/60 Hz operation.

Sigma Chemical Co., St. Louis,  
MO

Reader Service No. 348

## FishCHECK™ Rapid Test Kit Simplifies Assessment of Finfish Quality

GEM Biomedical, Inc. of Hamden, CT announces the introduction of the new FishCHECK™ Rapid Test Kit for the assessment of finfish quality during ice storage. This rapid assay requires minimal technical skill to run and yields actionable results in less than 30 minutes on a highly perishable food item.

The FishCHECK™ test kit is a visual, colorimetric assay that requires no instrumentation for analysis. The test kit contains all reagents necessary to performing the assay in a ready to use liquid format. Even the proprietary FishCHECK broth is provided in conveniently premeasured, unitized bottles.

The assay procedure is simple, consisting of 3 basic steps: prepare sample in FishCHECK broth, add reagents, and read the resulting color. Upon completion of the test, the operator simply compares the color developed in the test tube to those shown on the FishCHECK color chart and reports results.

The GEM Biomedical FishCHECK test kit has been developed for the routine analysis of catfish, codfish, and tuna fish. At GEM Biomedical's product development laboratory, work is ongoing to extend the variety of species with which the kit is compatible. Recent laboratory studies have revealed that the FishCHECK test kit correlates favorably with other analytical methods such as aerobic plate counts, K value determination, hydrogen sulfide measurement, trimethylamine determination, and sensory evaluation.

GEM Biomedical's FishCHECK test kit offers unique benefits to the fish handler, buyer, and processor who wants to shorten turnaround time on assessment of finfish quality. With results available in less than 30 minutes, several days can be saved when compared to traditional microbiology methods. With convenient, ready-to-use reagents, employees with minimal technical training can run the test, thus lowering staffing costs. Visual color development eliminates the need for investing in expensive analytical instrumentation and equipment.

Gem Biomedical, Inc., Hamden,  
CT

Reader Service No. 349

## The NFL Offers the Food Industry Technical Expertise in a Broad Range of Microbiological Services

The National Food Laboratory is uniquely qualified to assist you with those occasional microbiological contamination problems that occur when something slips through the Q.C. safety net. Our broad experience with many types of food processing operations allows us to successfully pinpoint the source of contamination and correct it.

In addition to solving problems, our professional microbiologists will assist you in preventing problems before they occur. Microbiological challenge, thermal death time, and inoculated pack studies provide information to adjust formulations, change packaging conditions, establish shelf-life and minimize microbiological food safety risks. As industry leaders in HACCP, we will assist you in designing, implementing and auditing your customized HACCP program resulting in the preparation of a safe food product.

The National Food Laboratory,  
Dublin, CA

Reader Service No. 350

## Innovative Products may Help Eliminate Deadly Disease

Qualicon™, A DuPont Subsidiary, has announced the commercial release of two new products: BAX™ for Screening/*E. coli* O157:H7, a system for detecting the potentially lethal strain of *Escherichia coli* in food; and BAX™ for Confirming Suspect Colonies, a highly accurate test that confirms the presence of pathogenic bacteria indicated by other testing methods. These products are the latest additions to the BAX™ family of genetics-based bacterial detection products that includes BAX™ for Screening/*Salmonella*.

The BAX™ products are the first to use the polymerase chain reaction (PCR) to detect bacteria in food.

PCR is a Nobel Prize-winning technique that can very rapidly produce millions of copies of a single segment of an organism's DNA. The BAX™ systems, through the use of packaged, tableted PCR reagents, make this technique easy and convenient to use. By using

genetic information to target pathogenic bacteria, the BAX™ systems are the most accurate products of their kind available.

BAX™ for Confirming Suspect Colonies represents a new category of test for product, ingredient and environmental samples, to be used when another testing method indicates a colony of bacteria that may be pathogenic. Because the BAX™ system uses a genetics-based method, it is highly accurate and rapid, providing the essential information a manufacturer or food processor needs to make a decision about a potentially tainted shipment. There is currently a BAX™ system for confirming the presence of *Salmonella*, the bacteria often found in eggs, milk and poultry. BAX™ systems for confirming *E. coli* O157:H7 and other pathogenic bacteria will be released later this year.

The BAX™ pathogen detection systems are sold under licensing arrangement with F. Hoffman-LaRoche, Ltd., Roche Molecular Systems, Inc. and The Perkin-Elmer Corporation.

Qualicon, Wilmington, DE

Reader Service No. 351

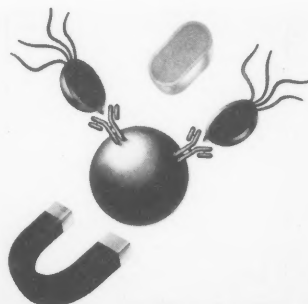
## ATCC Quantitative DNA Molecular Weight Standards Kit

American Type Culture Collection (ATCC) announces availability of the ATCC Quantitative DNA Molecular Weight Standards Kit. This kit accurately measures the size and quantity of experimental DNA samples in one simple step. The kit produces 16 standard gel bands which are easily visualized on an agarose gel using ethidium bromide staining. Size standards are generated for four DNA fragment lengths (0.94kb, 2.06kb, 3.0kb, and 4.4kb) and

quantitation standards at four concentrations of DNA (25ng/5µl, 50ng/5µl, 100ng/5µl, and 200 ng/5µl). Each kit contains sufficient material for 40 assays.

American Type Culture Collection, Rockville, MD

Reader Service No. 352



Dynal, Inc.

## Rapid Results with Culture Confirmation of Food-Borne Pathogens with Dynabeads® Microbiology Selective Enrichment Products

Dynabeads® anti-*E. coli* O157 and Dynabeads® anti-*Salmonella* are designed for rapid, immunomagnetic selective enrichment of microorganisms directly from pre-enrichment broths. The rapid and simple protocol (less than 1 hour) saves 24 hours of valuable testing time compared to culture methods using conventional selective enrichment media. Isolated colonies are achieved in 24 hours for *E. coli* O157 and 48 hours for *Salmonella*. A method for EHEC isolation which utilizes Dynabeads® anti-*E. coli* O157 appears in the 8th edition of the Bacteriological Analytical Manual (BAM).

Dynabeads® are uniform, superparamagnetic microspheres (2.8 microns in diameter) with

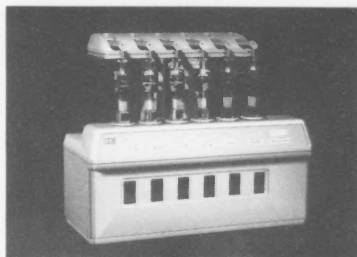
*The publishers do not warrant, either expressly or by implication, the factual accuracy of the products or descriptions herein, nor do they so warrant any views or opinions offered by the manufacturer of said articles and products.*

affinity purified antibodies on their surface. When incubated with a sample, Dynabeads® will bind their target bacterium forming a bacterium:magnetic bead complex. This complex is separated from the heterogeneous sample by performing the test in a magnetic test tube rack (Dynal MPC®-M). The isolated and concentrated bacterium:bead complex can then be cultured on any selective culture medium or used in other detection systems.

The benefits of Dynabeads® Immunomagnetic Separation are many. This highly sensitive system will detect as few as 100 organisms/ml of pre-enriched sample. Complete detection is achieved: over 200 serotypes (1400 strains) of *Salmonella* and both motile and non-motile strains of *E. coli* O157 have been tested. Improved bacterial isolation with this method also makes it useful for the culture confirmation of other presumptive methods. Protocols are simple and reagents are shelf stable. The versatility provided by this methodology will allow testing of many different sample types while enhancing the efficiency of existing manual and automated detection methods.

Dynal, Inc., Lake Success, NY

Reader Service No. 353



CEM Corporation

## CEM Brings Microwave Speed to "Samples on Demand" Digestion

CEM Corporation, the world pioneer in microwave technology for laboratory applications, has introduced its revolutionary STAR™ Technology Digestion System. The STAR (Simultaneous Temperature Accelerated Reactions) System, designed for large sample sizes and/or hard-to-digest samples, brings microwave speed to open-cavity digestions to produce samples on demand. Special features include: independent position vessels that let each vessel (up to six) run a separate digestion method, staggered start times so the STAR System's individual positions can fit into the laboratory work flow, optional program-controlled reagent addition during digestion, and individual temperature feedback con-

trol for highly reproducible results. The control software is easy to learn and the system is extremely reliable.

CEM Corporation, Matthews, NC

Reader Service No. 354

## Rapid Results from Charm Sciences

The ModuLite by Charm Sciences permits HACCP testing to be carried out on-site, with real time results. This portable system, which includes a removable, battery powered Charm Luminator, is compatible with a variety of modular single service, luminescence tests for in-line process quality testing of food products.

The PocketSwab monitors the cleanliness of equipment, surfaces or products in less than 45 seconds.

The CHEF Test is a rapid 3 minute test for cross-contamination of raw tissue/blood in product processing areas. The test can also indicate the cooking efficiency of meat, finfish, or shellfish processing in precooked product lines.

Other tests are available such as pesticide screening, somatic cells, a PMO approved pasteurization test and more.

Charm Sciences Inc., Malden, MA

Reader Service No. 355

# BusinessExchange

## Services/Products

### COMPLETE LABORATORY SERVICES

Ingman Labs, Inc.  
2945 - 34th Avenue South  
Minneapolis, MN 55405  
612-724-0121

Reader Service No. 153



### Michelson Laboratories, Inc.

6280 Chalet Drive, Los Angeles, CA 90040  
Telephone: (310) 928-0553 / (714) 971-0673 / FAX (310) 927-6625

#### COMPLETE ANALYSIS SPECIALIZING IN:

- Chemical
- Microbiological
- Sugar Profile
- Fatty Acid Profile
- Vitamin A & D
- Quality Assurance
- Consulting
- IMS-USPHS-FDA
- Antibiotic Analysis
- Approved 06143

MEMBER  
**ACIL**

#### TECHNIQUES AVAILABLE:

- Infrared Milk Analysis
- Mass Spectrometry
- Gas Chromatography
- Atomic Absorption
- Spectrophotometry
- Spectrofluorometry
- Microscopy
- Inductively Coupled Plasma
- Optical & Direct Microscopic Cell Count
- ELISA Methodology

Also Offering: Milk calibration Samples for Infra-red Milk Analyzer and Electronic Somatic Cell Counter

Reader Service No. 163

# Coming Events

## AUGUST

• **5-8, Food Ingredient Technology**, in New Brunswick, NJ. This course is offered by The Center for Professional Advancement and is designed to answer effectively a major problem facing food companies in the development of successful food products; namely, knowing how to choose and use properly the various ingredients that are the key to making food products that the consumer will purchase and repurchase. The cost for the 3 day course is \$995.00. For additional information, contact The Center for Professional Advancement, P. O. Box 1052, 144 Tices Lane, East Brunswick, NJ 08816-1052 or call (908) 238-1600; fax (908) 238-9113.

## SEPTEMBER

• **2-3, Symposium on Yeast in the Dairy Industry**, Copenhagen, Denmark. The main objective of this Symposium is to provide a comprehensive view of the role of yeasts, both positive and negative aspects, in the dairy industry. For registration information, contact Prof. M. Jakobsen, The Royal Veterinary and Agricultural University, Dept. of Dairy and Food Science, Rolighedsvej 30, DK-1958 Frederiksberg C Denmark; telephone +45 35 28 32 15; fax +45 35 28 32 14.

• **6-7, International Symposium on the Influence of Codex Standards on International Trade in Dairy Products**, Düsseldorf, Germany. The symposium is intended for: general management, product development, product manufacturing, legislation, exporters/importers, and supervising and food inspection authorities. For additional information, contact Th. Kützemeier (Chair), German NC, Tel.: +49 228 98 24 3-0, fax: +49 228 98 24 3-20.

• **10-12, Producing Safe Dairy Products Workshop**, hosted by The Wisconsin Center for Dairy Research in Madison, WI. Two days will be devoted to discussing the microbiology and control of dairy pathogens; one day will be dedicated to HACCP and other sanitation methods used in dairy plants and food processing systems. For more information, contact Sara Quinones at (608) 262-2217; fax (608) 262-1578; e-mail: quinones@ahabs.wisc.edu, 1605 Linden Dr., Madison, WI 53706.

• **10-14, The 11th International Packaging & Food Processing Machinery and Materials Exhibition**, Jakarta, Indonesia. For further information, telephone +44 (0)171 486 1951; fax +44 (0)171 486 8773 or +44 (0)171 413 8222.

• **11-12, 75th Anniversary of the Vermont Dairy Industry Association**, held at the Ramada Inn, S. Burlington, VT. For further information, contact Mr. Byron Moyer at 116 State St., Drawer 20, Montpelier, VT 05620-2901 or phone (802) 828-2433; fax (802) 828-2361.

• **12, 1996 Fall Education Conference**, sponsored by the Wisconsin Laboratory Association at the Chula Vista Resort in Wisconsin Dells, WI. Presenters were selected with the theme of Laboratory Safety. For additional information, contact the Conference Chairman, Greg Hustad at (715) 235-1128 or WLA President, George Nelson at (715) 232-2560.

• **12-13, HACCP Program Presents Hands-on Workshop**, in Chicago, IL. This workshop provides for an intensive day and a half evaluation of HACCP principles and elements for developing a successful program. Participants evaluate their HACCP plan against those designed by the experts. For additional information or to enroll, contact AIB, 1213 Bakers Way, Manhattan, KS 66502; phone (913) 537-4750; fax (913) 537-1493.

• **15-19, American Association of Cereal Chemists to Hold 81st Annual Meeting**, in Baltimore, MD at the Baltimore Convention Center. The annual meeting includes a technical program, technical and poster sessions, table-top exhibits, new products/services sessions, educational short courses and social events. Annual Meeting registration materials are available after May 1, 1996, from AACC headquarters, 3340 Pilot Knob Road, St. Paul, MN 55121-2097; telephone (612) 454-7250; fax (612) 454-0766.

• **17-20, Florida Public Health Association's 1996 Annual Educational Conference**, in Sarasota, FL. For further information, contact John M. McGuire or Vicki Hewell at the FPHA office (904) 387-5992.

• **24-26, New York State Association of Milk & Food Sanitarians Annual Conference**, Sheraton Inn, Liverpool, NY. For further information/details, contact Janene Lucia, Executive Secretary, NYSAMFS at: (607) 255-2892; fax (607) 255-7619; e-mail: jgg3@cornell.edu.

• **25-27, South Dakota Assn. of Healthcare Organizations 70th Annual Convention**, Rapid City, SD. Please direct all questions or comments to: Bud Jones or Suzanne Paradeis, SDAHO, 3708 Brooks Place, Suite #1, Sioux Falls, SD 57106; phone (605) 361-2281; fax (605) 361-5175.

• **26-27, MEHA's 8th Annual Food Protection Conference**, at Bill Oliver's Best Western Hotel in Cadillac, MI. For further information, contact Janet Morlik at (810) 257-3199.

• **30, Hazardous Waste Regulations for Generators**, offered by The University of Florida's Center for Training, Research and Education for Environmental Occupations (UF/TREEO) in Tampa, FL. The course teaches participants the latest require-



ments and the proper procedure for the accumulation, storage, transportation, and disposal of hazardous waste. Procedures for developing a contingency plan and how to comply with the DOT regulations that relate to hazardous waste are explained. The cost for the course is \$295.00. To register call (352) 392-9570, ext. 112.

• **30-Oct. 4, Upakovka '96 and Agroprodmasch '96 to be Held Concurrently**, in Moscow, Russia. Organized by NOWEA International, the foreign subsidiary of the Düsseldorf Trade Fair Company in Germany. The Düsseldorf Trade Fair Company is renowned as the organizer of interpack, the world's largest trade show for packaging machinery and materials and confectionery machinery. For further information, contact Düsseldorf Trade Shows, New York, 70 West 36th St., Suite 605, New York, NY 10018; telephone (212) 356-0400; fax (212) 356-0404 or visit the web site at <http://www.dtsusa.com/dts/>.

## OCTOBER

• **2-4, International Conference on New Developments in Refrigeration for Food Safety and Quality Call for Papers, Co-sponsored by IAMFES**. Lexington, KY. Conference papers are sought from all areas of food refrigeration. The purpose of this conference is to provide an opportunity for food technologists, food processors, and refrigeration engineers from around the world to exchange current information on the role of refrigeration in the food chain. For further information, contact Food Refrigeration Conference, Univ. of Kentucky, 128 Agriculture Engineering Bldg., Lexington, KY 40546-0276; phone (606) 257-3000 ext. 111; fax (606) 257-5671; e-mail [wmurphy@bae.uky.edu](mailto:wmurphy@bae.uky.edu).

• **5-9, Water Environment Federation's 69th Annual Conference**, at the Dallas Convention Center in Dallas, TX. This year's conference theme focuses on environmental education. For conference information, in the U.S. and Canada call (800) 666-

0206; outside the U.S. and Canada call (703) 684-2452; or in the U.S. and Canada fax (800) 444-2WEF; outside the U.S. and Canada (908) 885-6417.

• **8-12, 1st World Congress on Calcium and Vitamin D in Human Life**, Rome, Italy. Discussion will include the need to protect consumers through improved food quality and measures to enhance the quality and safety of food. Emphasis will be given to public communication and education, including reaching high-risk groups. For further information, contact Congress Secretariat, Maxitraveland s.r.l.-Via Zoe Fontana 220,00131 Rome, Italy; tel. +39.6.4131415; fax +39.6.4191868.

• **9-10, Iowa Association of Milk, Food and Environmental Sanitarians, Inc. Annual Conference**, Waterloo, IA at the Starlight Best Western. For further information, contact Janet Burns at (319) 927-3212.

• **15-16, Symposium on Microbial Food Spoilage**, Copenhagen, Denmark. Participants are invited to present posters related to microbial food spoilage. An abstract of maximum one page should be sent before September 1 to: Lene Jensen, Danish Institute of Fisheries Research, Dept. of Seafood Research, Technical University of Denmark, Bldg. 221, DK-2800 Lyngby, Denmark; phone +45 4525 2580; fax +45 4588 4774; e-mail: [lej@ffi.min.dk](mailto:lej@ffi.min.dk). For further information on registration phone +45 88 33 22; fax +45 45 88 47 74; e-mail: [fish@ffi.min.dk](mailto:fish@ffi.min.dk).

• **16-18, 16th-Food Microbiology Symposium and Workshop**, Univ. of Wisconsin, River Falls, WI. The workshop is designed to provide practical demonstrations and discussion of various tests and instruments available for rapid detection, isolation and characterization of food-borne pathogens and toxins as well as prediction of shelf-life and checking hygiene and sanitation in food processing facilities. For further information, contact Dr. Purnendu C. Vasavada, Dept. of Animal and Food Science, Univ. of Wisconsin-River Falls, River Falls, WI 54022 or phone (715) 425-

3150; fax (715) 425-3785; internet: [purnendu.c.vasavada@uwrf.edu](mailto:purnendu.c.vasavada@uwrf.edu).

• **16-18, Food Regulations & Their Impact on Product Development Seminar**, at Hotel International, Basel, Switzerland. This seminar provides comprehensive information about food regulations in the EC/EU, USA, and Latin America, using real-world examples to illustrate the effects of legislation, and how to achieve compliance. For detailed seminar agenda and registration information, please contact: Program Division: TECHNOMIC Publishing Co., Inc., 851 New Holland Ave., Box 3535, Lancaster, PA 17604 or phone (717) 291-5609/(800) 233-9936; fax (717) 295-9637.

• **20-23, The 1996 International Exposition for Food Processors\* (IEFP) will Host "El Congreso de las Americas,"** at San Francisco's Moscone Center. IEFP attracts visitors from around the world in every segment of the processing industry, including canning and freezing, dairy, beverages, meat, pharmaceuticals and other industry segments. For more information, contact Janet Palmisano, Communications Coordinator at (703) 684-1080.

• **27-29, International Whey Conference**, sponsored jointly by the American Dairy Products Institute (ADPI), the U.S. National Committee of IDF (USNAC), and the International Dairy Federation (IDF) at the Westin Hotel O'Hare, Rosemont, IL. This international conference will bring together manufacturers of whey and whey products, firms manufacturing equipment used in whey processing, business leaders of the industry, and government and university researchers from throughout the world to discuss current topics of interest relating to the production, research, marketing and utilization of whey and whey products. Anyone interested in presenting papers at the conference should contact Dr. Warren S. Clark, Jr., Chief Executive Officer, American Dairy Institute, 130 N. Franklin St., Chicago, IL 60606; phone (312) 782-5455; fax (312) 782-5299.

•28-31, **Demands on Animal Hygiene Education and Research Seminar**, sponsored by Universidad Autonoma Metropolitana (UAM). An analysis of American and European requirements. The main subjects of discussion are: concepts on animal hygiene and environment; teaching methodology on animal hygiene; and theoretical and practical aspects. For more information, contact Dr. Jorge Saltijoral, UAM, Departamento de Produccion Agricola y Animal, Calzada del hueso 1100, Col. Villa Quietud, Coyoacan, C.P. 04960 Mexico D.F., or fax (525) 723-5480; e-mail [oaxaca@cueyatl.uam.mx](mailto:oaxaca@cueyatl.uam.mx).

•30-Nov. 2, **Worldwide Food Expo '97**, to be held in Chicago, IL. The Dairy & Food Industries Supply Association (DFISA) the International Dairy Foods Association (IDFA) and the National Food Processors Association (NFPA), have Worldwide Food Expo positioned as the one trade show to encompass the entire product supply and service world of the food processing industry. For further information, contact Dairy and Food Industries Supply Assn., 1451 Dolley Madison Blvd., McLean, VA 22101-3850; telephone (703) 761-2600 or fax (703) 761-4334.

•31-Nov. 2, **NAMA National Convention and Exhibition**, Cervantes Convention Center, St. Louis, MO. Exhibitors of vending machines, food products and services related to the industry. For additional information, contact Larry Eils at (312) 346-0370.

**NOVEMBER**

•17-21, **The American Public Health Association's 124th Annual Meeting & Exposition**, at the New York Coliseum in New York City. For further information call (202) 789-5646.

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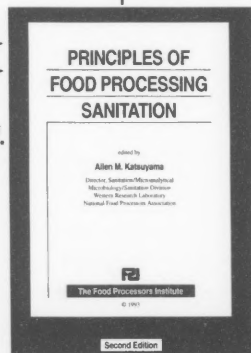
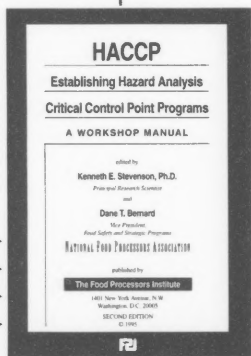
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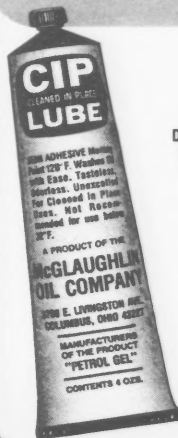
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# IAMFES Policy on Commercialism

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## 1. INTRODUCTION

No printed media, technical sessions, symposia, posters, seminars, short courses, and/or all related type forums and discussions offered under the auspices of IAMFES (hereafter referred to as IAMFES forums) are to be used as platforms for commercial sales or presentations by authors and/or presenters (hereafter referred to as authors) without the expressed permission of the IAMFES staff or Executive Board. IAMFES enforces this policy in order to restrict commercialism in technical manuscripts, graphics, oral presentations, poster presentations, panel discussions, symposia papers, and all other type submissions and presentations (hereafter referred to as submissions and presentations), so that scientific merit is not diluted by proprietary secrecy.

Excessive use of brand names, product names or logos, failure to substantiate performance claims, and failure to objectively discuss alternative methods, processes, and equipment are indicators of sales pitches. Restricting commercialism benefits both the authors and recipients of submissions and presentations.

This policy has been written to serve as the basis for identifying commercialism in submissions and presentations prepared for IAMFES forums.

## 2. TECHNICAL CONTENT OF SUBMISSIONS AND PRESENTATIONS

### 2.1 Original Work

The presentation of new technical information is to be encouraged. In addition to the commercialism evaluation, all submissions and presentations will be individually evaluated by the Program Advisory Committee (PAC) chair, technical reviewers selected by the PAC chair, session convenor, and/or IAMFES staff on the basis of originality before inclusion in the program.

### 2.2 Substantiating Data

Submissions and presentations should present technical conclusions derived from technical data. If products or services are described, all reported capabilities, features or benefits, and performance parameters must be substantiated by data or by an acceptable explanation as to why the data are unavailable (e.g., incomplete, not collected, etc.) and, if it will become available, when. The explanation for unavailable data will be considered by the PAC chair and/or technical reviewers selected by the PAC chair in order to ascertain if the presentation is acceptable without the data. Serious consideration should be given to withholding submissions and presentations until the data are available as only those conclusions that might be reasonably drawn from the data may be presented. Claims of benefit and/or technical conclusions not supported by the presented data are prohibited.

### 2.3 Trade Names

Excessive use of brand names, product names, trade names, and/or trademarks is forbidden. A general guideline is to use proprietary names once and thereafter to use generic descriptors or neutral designations. Where this

would make the submission or presentation significantly more difficult to understand, the PAC chair, technical reviewers selected by the PAC chair, session convenor, and/or IAMFES staff will judge whether the use of trade names, etc., is necessary and acceptable.

### 2.4 "Industry Practice" Statements

It may be useful to report the extent of application of technologies, products, or services, however, such statements should review the extent of application of all generically similar technologies, products, or services in the field. Specific commercial installations may be cited to the extent that their data are discussed in the submission or presentation.

### 2.5 Ranking

Although general comparisons of products and services are prohibited, specific generic comparisons that are substantiated by the reported data are allowed.

### 2.6 Proprietary Information (See also 2.2.)

Some information about products or services may be proprietary to the author's agency or company, or to the user and may not be publishable. However, their scientific principles and validation of performance parameters must be described. Conclusions and/or comparisons may only be made on the basis of reported data.

### 2.7 Capabilities

Discussion of corporate capabilities or experiences are prohibited unless they pertain to the specific presented data.

## 3. GRAPHICS

### 3.1 Purpose

Slides, photographs, videos, illustrations, art work, and any other type visual aids appearing with the printed text in submissions or used in presentations (hereafter referred to as graphics) should be included only to clarify technical points. Graphics which primarily promote a product or service will not be allowed. (See also 4.6.)

### 3.2 Source

Graphics should relate specifically to the technical presentation. General graphics regularly shown in, or intended for, sales presentations cannot be used.

### 3.3 Company Identification

Names or logos of agencies or companies supplying the goods or services must not appear on the graphics, except on the first slide of the presentation. Slides showing products may not include predominant nameplates. Graphics with commercial names or logos added as background borders or corners are specifically forbidden.

### 3.4 Copies

Graphics that are not included in the preprint may be shown during the presentation only if they have been reviewed in advance by the PAC chair, session convenor,



and/or IAMFES staff, and have been determined to comply with this policy. Copies of these additional graphics must be available from the author on request by individual attendees. It is the responsibility of the session convenor to verify that all graphics to be shown have been cleared by PAC chair, session convenor, IAMFES staff, or other reviewers designated by the PAC chair.

#### 4. INTERPRETATION AND ENFORCEMENT

##### 4.1 Distribution

This policy will be sent to all authors of submissions and presentations in IAMFES forums.

##### 4.2 Assessment Process

Reviewers of submissions and presentations will accept only those that comply with this policy. Drafts of submissions and presentations will be reviewed for commercialism concurrently by both IAMFES staff and technical reviewers selected by the PAC chair. All reviewer comments shall be sent to and coordinated by either the PAC chair or the designated IAMFES staff. If any submissions are found to violate this policy, authors will be informed and invited to resubmit their materials in revised form before the designated deadline.

##### 4.3 Author Awareness

In addition to receiving a printed copy of this policy, all authors presenting in an IAMFES forum will be re-

mindful of this policy by the PAC chair, their session convenor, or the IAMFES staff, whichever is appropriate.

##### 4.4 Monitoring

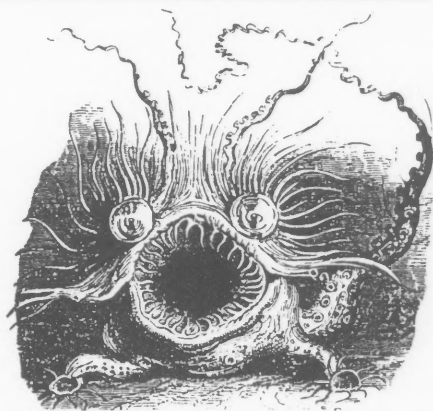
Session convenors are responsible for ensuring that presentations comply with this policy. If it is determined by the session convenor that a violation or violations have occurred or are occurring, he or she will publicly request that the author immediately discontinue any and all presentations (oral, visual, audio, etc.), and will notify the PAC chair and IAMFES staff of the action taken.

##### 4.5 Enforcement

While both technical reviewers, session convenors, and/or IAMFES staff may check submissions and presentations for commercialism, ultimately it is the responsibility of the PAC chair to enforce this policy through the session convenors and IAMFES staff.

##### 4.6 Penalties

If the author of a submission or presentation violates this policy, the PAC chair will notify the author and the author's agency or company of the violation in writing. If an additional violation or violations occur after a written warning has been issued to an author and his agency or company, IAMFES reserves the right to ban the author and the author's agency or company from making presentations in IAMFES forums for a period of up to two (2) years following the violation or violations.



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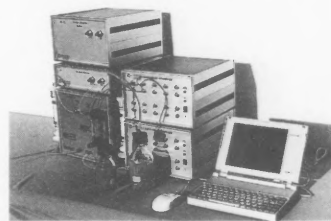
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# This is Your Personal Invitation to Join

The International Association of Milk, Food and Environmental Sanitarians, founded in 1911, is a non-profit educational association of food protection professionals. The IAMFES is dedicated to the education and service of its members, specifically, as well as industry personnel in general. Through membership in the Association, IAMFES members are able to keep informed of the latest scientific, technical and practical developments in food protection. IAMFES provides its members with an information network and forum for professional improvement through its two scientific journals, educational annual meeting and interaction with other food safety professionals.

## Who are IAMFES Members?

The Association is comprised of a diverse membership of over 3,200 from 75 nations. IAMFES members belong to all facets of the food protection arena. The main groups of Association members fall into three categories: Industry Personnel, Government Officials and Academia.

## Why are They IAMFES Members?

The diversity of its membership indicates that IAMFES has something to offer everyone involved in food protection and public health.

## Your Benefits as an IAMFES Member

**Dairy, Food and Environmental Sanitation** — Published monthly, this is the official journal of IAMFES. Its purpose is the disseminating of current information of interest to the general IAMFES membership. Each issue contains three to five informational applied research or general interest articles, industry news and events, association news, columns on food safety and environmental hazards to health, a food and dairy industry related products section, and a calendar of upcoming meetings, seminars and workshops. All regular IAMFES members receive this publication as part of their membership.

**Journal of Food Protection** — A refereed monthly publication of scientific research and authoritative review articles. Each issue contains 15 to 20 technical research manuscripts and one to five articles reporting a wide variety of microbiological research pertaining to food safety and quality. The *Journal of Food Protection* is internationally recognized as the leading publication in the food and dairy microbiology field. This journal is available to all individuals who request it with their membership.

**The IAMFES Annual Meeting** — Held in a different city each year, the IAMFES Annual Meeting is a unique educational event. Three days of technical sessions, scientific symposia and commercial exhibits provide members and other industry personnel with over 200 presentations on the most current topics in food protection. It offers the opportunity to discuss new technologies and innovations with leading authorities in various fields concerned with food safety. IAMFES members receive a substantially reduced registration fee.

## To Find Out More...

To learn more about IAMFES and the many other benefits and opportunities available to you as a member, please call (515) 276-3344 or (800) 369-6337; fax (515) 276-8655.

*"The mission of IAMFES is to provide food safety professionals worldwide with a forum to exchange information on protecting the food supply"*



# International Association of Milk, Food and Environmental Sanitarians

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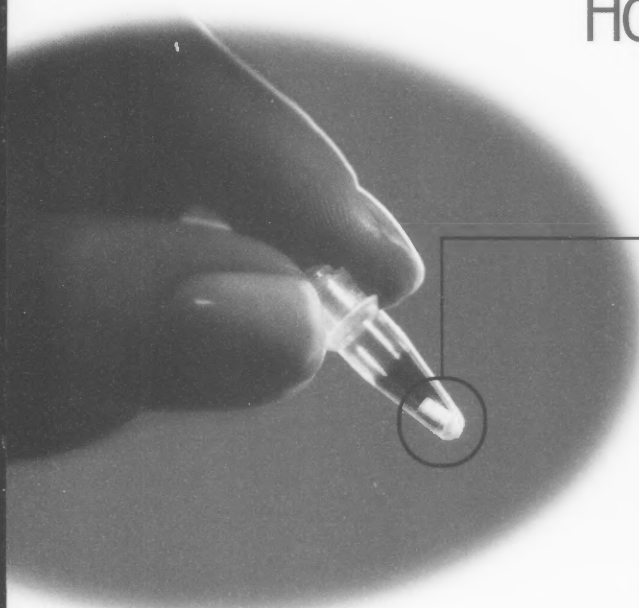
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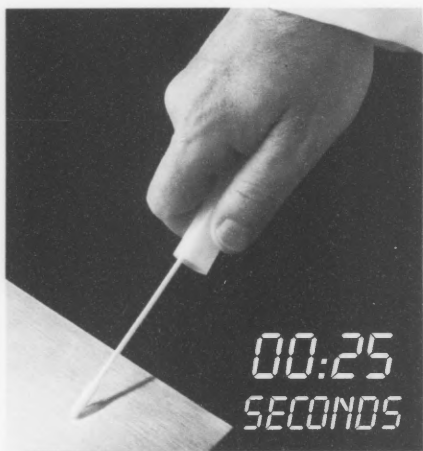
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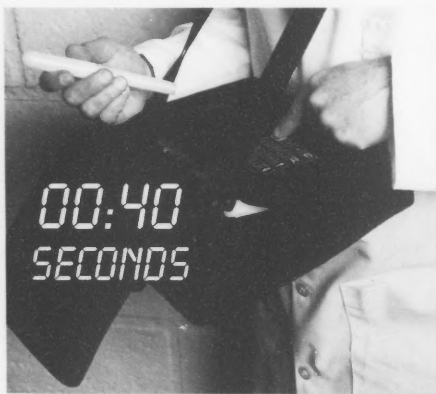
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