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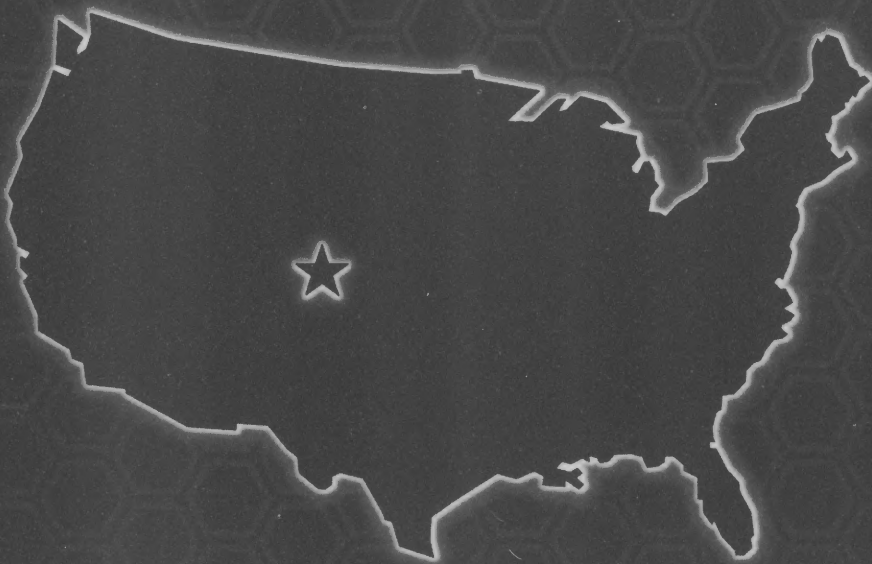
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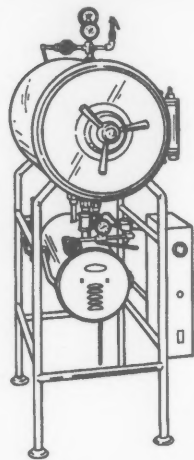
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OFF THE TOP

FROM THE PRESIDENT



By MICHAEL H. BRODSKY
IAMFES President

“For whom the bell tolls”

Unfortunately, the bell tolls for me! It's hard to believe that a year has passed since I took office as President of IAMFES. I accepted the gavel at our 83rd Annual Meeting in Seattle, WA and soon after you have read this column, I will be passing it on to Incoming President, Gale Prince, at our 84th Annual Meeting in Orlando, FL.

Despite the knowledge that my term of office will be coming to an end, I am still looking forward to our Meeting at the Hyatt Regency Grand Cypress in Orlando. It will give me an opportunity to greet old friends and colleagues and meet the newer members of our Association. I hope that all of you had marked the dates of July 6 - July 9, 1997 clearly on your calendars and have made the necessary arrangements to come to the Annual Meeting with your families. In addition to being able to attend some outstanding food safety symposia and technical sessions and visiting with our corporate sponsors and exhibitors, the hotel facilities and location are excellent for a little bit of family fun as well. This is also your opportunity to network informally with colleagues from the international scientific community, or to meet more formally for specific discussions in the various Professional Development Groups, Committees, etc. I look forward to seeing you all there. Please don't hesitate to come and see me.

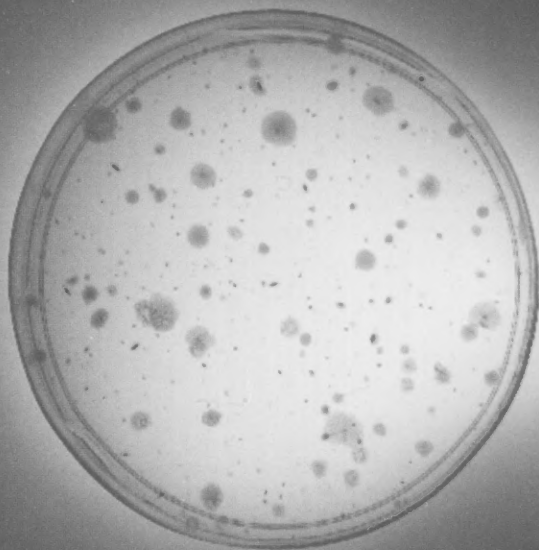
As the year winds down, I think that we can all reflect with pride on what the Association has accomplished since the new Executive Board took office and look forward to an even more exciting future. Certainly, one of the highlights has been the “internationalization” of IAMFES, with an affiliate to be chartered in Korea and another being organized in France. In addition, IAMFES took the lead in having the eligibility restriction for the Crumbine Award phased out. Starting in 1998, local health units in Canada will be eligible to apply for the award. We will continue

to strive for globalization so that ultimately all geographical restrictions will be removed to make it a truly international award. We expect that support for the award will also be broadened to reflect this international scope.

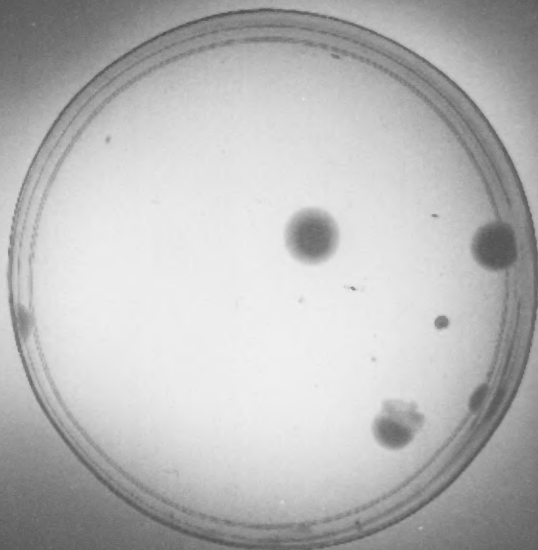
The appointment of David Tharp as Executive Director was a major step in bringing stability and cohesiveness to the office. There is a renewed sense of teamwork and common purpose emanating from 6200 Aurora Ave., Suite 200W, Des Moines, IA 50322-2863. The quality of *DFES* and *JFP* continues to improve, not only in their layout and appearance, but also in the number of articles being published and the publication turn-around-time. IAMFES will soon be going “on-line” and has taken the first step by registering its domain name. Keep your eyes open for our web page which we hope to have in place by the end of this summer. Our financial position is stronger now than ever before and provides us with the framework to develop programs to meet your needs and expectations. Membership continues to be stable, but we still need more corporate sponsorship and more members of the affiliates to join the International. With your support and involvement, IAMFES will continue to be recognized as the association which provides food safety professionals worldwide with a forum to exchange information on protecting the food supply.

As always, if you have any comments on this column, please don't hesitate to contact me (E-mail: brodskm@gov.on.ca; Phone: (416) 235-5717 or Fax: (416) 235-5951).

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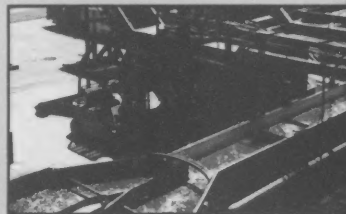


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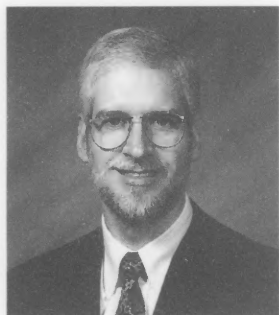
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COMMENTARY

FROM THE EXECUTIVE DIRECTOR



By DAVID W. THARP
IAMFES Executive Director

Our goals revolve around membership services and growing the membership”

At the April Executive Board meeting, many things took place and I thought this column would be a good place to update you about these items. Your President, Michael Brodsky, was unable to attend this meeting because of a family emergency. In his absence, President-Elect, Gale Prince presided over the meetings. Michael has attended every meeting of the Board since joining in 1993. His presence was missed.

A budget was presented and approved that allows for approximately \$16,000 to be added to the General Fund of the Association. I assure you that the Association is in good financial health and able to meet all commitments that we currently have. We are dealing with a “negative” fund balance in the General Fund which means that we need to spend less monies than what we take in during the next few years. We have made progress over the last three or four years in reducing the negative fund balance and continue to work toward the goal of having a positive fund balance.

Included in the budget were the normal cost of living increases in many of the fees we charge to Members and Non-members. One item not affected was our membership dues. I am happy to report that the Board approved the budget without increasing the regular membership dues.

I mentioned in an earlier column that we would be holding a planning day with the Executive Board and the IAMFES staff at this Board meeting. We did so, and I believe that all who participated were able to feel the sense of working together to achieve our common goals. I received com-

ments from Board Members and staff that the time was well spent and helped the Board and staff to understand the workings of each other.

As a result of the planning day, we set numerous goals to be achieved over the next three years. Most of the goals revolved around membership services and growing the Membership. In order to carry out and reach these goals, it became evident that our current database was not capable of providing the structure needed to handle our plans efficiently. We are currently operating with up to 20 separate databases! Funds were included in the approved budget to purchase software for a relational database that will serve our membership and office for many years to come. Installation will begin this fall and you should see some of the changes prior to the end of 1997.

We also want to expand on our educational offerings. This will include adding regional workshops or seminars, providing books of interest to our Membership and establishing an IAMFES web site. The basic web site should be established by the end of summer with additional features to be added in the future. Our opportunities are surely unlimited.

I believe what we came out of the planning session with was a clear directive from the Executive Board to grow the Membership. The Board has approved the expenses to be incurred in establishing a framework to enable our staff to work efficiently in serving the growing needs of our Members. Our staff is looking forward to the challenges ahead and as always, is ready to serve your needs.



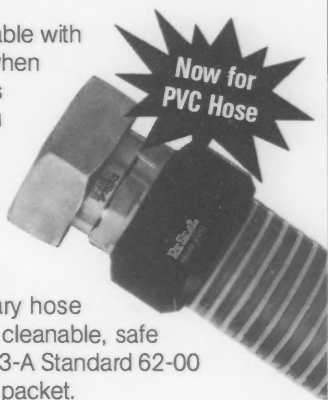
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Assessing the Handling Practices of Ready-to-Use Vegetables in Ontario's Health Care Food Service Facilities

Samuel L. Wang,^{1*} Joseph Odumeru,² and Alice Hadzis³

SUMMARY

Temperature control and handling practices of packaged ready-to-use (RTU) vegetables were monitored during two shipping tests to selected hospitals in Ontario. Eight hospitals via five shipping routes in the first test and 14 hospitals via seven routes in the second test were assessed weekly. Temperatures outside the 1 to 5°C range were found in shipping trucks, distributors' warehouses and hospital coolers in both tests. Most temperature infractions reflected a lack of comprehension of the importance of temperature control for RTU vegetables. Freezing temperatures were encountered twice in trucks and once in a hospital cooler during the winter shipping test period. Defective packages from the processor were found in one shipment during the summer shipping test period. Among the packages examined in the hospital coolers, 26.1% and 34.3% of the packages were found with expired date codes and less than 2% O₂, respectively. A large part of these packages were from two hospitals. This study showed a need to establish critical control points for RTU vegetables throughout the delivery chain in an effective Hazard Analysis of Critical Control Points (HACCP) program with adequate personnel training and a preventive maintenance program to keep all refrigeration equipment in working condition.

INTRODUCTION

As the food service industry searched for ways to improve efficiencies, prepackaged RTU vegetables gained more acceptance in North America in the 90s. Many health care food service units in Ontario began buying RTU vegetables regularly. Previous research showed that, even at refrigerated temperatures, an anaerobic condition may occur inside the package of RTU vegetables and support the growth of pathogens, such as *Clostridium botulinum* (4) and *Listeria monocytogenes* (2, 3). If allowed to occur in the delivery chain, temperature abuses can cause a health hazard.

Except in a few major fast food service chains, which use a large volume of RTU vegetables, handling practices of RTU vegetables through the delivery system to food establishments are not closely monitored either by the buyers or by any governmental agency. Only recently, some guidelines on quality have been worked out by the USDA (6) and Agriculture and Agri-Food Canada (1), but an industrywide

TABLE 1. Temperature infractions of delivered RTU vegetables from processor to hospitals in February 1994

Delivery route	Temp. charts retrieved	Total no. ^a of temp. infractions	Extreme temp. ^c reached	Frequency ^b	Total duration, h	Location ^c
I	3	1	-2.2	1	2	T
II	4	12	5.5	3	9.5	H
			6.1	5	20	H
			6.7	2	7	H
			8.3	1	20	H
			9.4	1	8	H
III	4	4	5.5	2	6	H
			6.1	1	10	W
			7.2	1	12	W
IV	4	2	5.5	1	0.5	H
			10.0	1	5	T
V	3	4	5.5	1	3	W
			-1.7	1	1	T
			-1.1	2	42	H

^aTotal number of temperature infractions outside 1 to 5°C range.

^bFrequency of infraction at each temperature outside 1 to 5°C range.

^cLocation: T = Truck; W = Warehouse; H = Hospital.

quality standard has not been established. Under this circumstance, the health care food service industry, which caters to health-compromised people, must learn more about the safe use of RTU vegetables.

To address this concern, the Hospital Purchasing Program of the Ontario Hospital Association (now HealthPRO Procurement Services Inc.), collaborating with the Horticultural Research Institute of Ontario, the Agricultural and Food Laboratory Services Centre, and industry stakeholders, conducted two shipping tests. The objectives were (i) to monitor the effectiveness of temperature control of the

delivery system, including distributors' warehouses, trucks, and hospital coolers, (ii) to evaluate the handling practices of hospital food service personnel, and (iii) to assess the general quality of RTU vegetables in the hospital cooler.

MATERIALS AND METHODS

Materials

RTU vegetables, including chopped iceberg lettuce, salad mix, broccoli florets, celery sticks, sliced green pepper, carrot sticks, sliced onions, and coleslaw mix, were supplied by a fresh vegetable processor in Ontario.

Selection of hospitals and delivery routes

Representative hospitals were selected from the 219 Ontario hospitals on the basis of size, distance from the processor's facility, and the number of transfers by the distributors. In the first test, five delivery routes from the processor to eight hospitals in Southern Ontario were monitored. In the second test, seven delivery routes to 14 hospitals throughout Southern and Eastern Ontario were monitored.

Duration and time of the tests

The first test was conducted for four weeks in February 1994, when outside temperatures were low. The second test was conducted for eight weeks from July to September 1995, when outside temperatures were high.

Temperature monitoring during shipment

Temperature changes during each shipment were monitored continuously with a time-temperature recorder (Ryan's Instruments, Redmond, WA) concealed in a product carton. The 7-day temperature recording charts were recovered from the hospital coolers and reviewed. The extreme temperatures were noted and the frequency of these temperature infractions outside the 1 to 5°C range was summarized from the temperature records. To ensure that no temperature abuse occurred when products changed hands, the temperatures of RTU vegetables were also checked by the receiving personnel using a bimetallic thermometer each time the products were unloaded at the distributors' warehouses and the hospital facilities.

Evaluation of the keeping quality of RTU vegetables

Laboratory personnel visited each health care facility weekly and carried out the following tasks:

- (1) Checked temperatures at six spots in the cooler (front and back as well as top, middle, and bottom

TABLE 2. Types and frequencies of problems in the delivery of RTU vegetables from processor to hospital in summer 1995

Week	Processor		Distributor		Hospital		
	Poor seal	High temp.	High blower temp.	High cooler temp.	No. of packages inspected	No. of expired product	No. of packages with <2% O ₂
1		2 ^b	1 ^c	5 ^c	69	19	4
2		1	3	3	67	14	12
3			1	4	72	13	27
4		1	2	2	48	34	30
5		4	1	2	52	14	26
6		4	2	3	72	14	31
7		1	1	2	25	3	8
8	1 ^a	1	5	3	35	4	13
Total	1	14	16	24	440	115	151
					3.3% ^d	26.1% ^e	34.3% ^e

^aFrequency of occurrence.

^bFrequency of temperature higher than 1 to 5°C in distributors' facilities.

^cFrequency of temperature higher than 1 to 5°C in hospitals' facilities.

^dPercentage of total packages delivered to the hospitals.

^ePercentage of total packages inspected in the hospitals.

level, including one directly in front of the blower fan) using a hand-held digital thermometer.

- (2) Measured the O₂ content of one sample per type of product from each carton in the cooler with a portable oxygen analyzer (Mocon LC700F, Minneapolis, MN).
- (3) Examined the product date codes, the appearance of the vegetables, and the general storage conditions of each carton of products in the cooler.

RESULTS AND DISCUSSION

In the winter shipping test, unacceptable temperatures outside the 1 to 5°C range occurred on all five delivery routes (Table 1). From the temperature charts recovered from 18 shipments, extreme temperatures outside the 1 to 5°C

range, their frequency of occurrence, and total duration were recorded. High temperatures occurred more often in distributors' warehouses and hospital coolers than in shipment except in one incident, where the temperature in a truck reached 10°C for 5 hours. Freezing temperatures occurred twice in the trucks (caused likely by the subzero weather) and once in a hospital cooler (Table 1).

Several unacceptable storage conditions in the hospital coolers were observed during hospital visits: unopened cartons stacked tightly against a wall obstructing air circulation; cartons stacked in front of the circulation fan; or packages with expired date codes. In addition, packages were found with less than 2% O₂. These findings prompted a one-year microbiological study in 1995 (5).

During the summer shipping test, which was conducted along

with the microbiological study, some packages with poor seals were found in one shipment from the processor (Table 2). This defect may be attributable either to defective film or faulty sealer and will shorten shelf life.

There were 14 incidents of temperature infractions in distributors' facilities during the same period (Table 2) – high temperature occurred when products were shipped in a truck with defective equipment or left on the loading dock. Warming of packaged RTU vegetables, especially in anaerobic packages, is a health hazard.

Temperatures higher than 5°C were also recorded from hospital blowers (16 times) and coolers (24 times) during the test period (Table 2). However, most high temperatures were observed from the coolers of two of the 14 hospitals (4 and 7 times out of 8 visits, respectively). The high temperatures were caused either by aging refrigeration equipment or by leaving the cooler door open during meal preparation.

Besides temperature monitoring, 440 bags of products, which amount to 3.3% of the 13,175 bags delivered to the hospitals over the 8-week test period, were examined inside the cooler for date codes and O₂ concentration (Table 2). Among the bags examined, date codes for 115 packages (26.1%) were expired, and O₂ concentration in 151 packages (34.3%) was less than 2%. One hospital facility accounted for a large share of expired packages (38 out of 115 packages).

The findings indicate that the delivery system of RTU vegetables from the processor to the hospitals in Ontario must be improved to ensure their safe use. A HACCP program, which includes personnel training in handling practices for RTU vegetables and maintaining reliable refrigeration equipment by the transportation industry, should be implemented.

The hospital food service personnel also need to upgrade their knowledge of safe food handling for RTU vegetables. Temperature abuses inside the hospital coolers must be minimized by preventive

maintenance and close monitoring of temperature. Older equipment incapable of maintaining required temperatures must be replaced. Proper temperature control, stock rotation, and other precautions established in the HACCP program should be enforced by the food service personnel in the health care facilities.

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This is the first part of a four-part series

Developing HACCP Plans: Overview of Examples for Teaching

Dane T. Bernard,¹ William R. Cole,² David E. Gombas,^{*} Merle Pierson,³
Robert Savage,⁴ R. Bruce Tompkin,⁵ and Robert P. Wooden⁶

SUMMARY

Availability of HACCP plans that are complete, well documented and can be used as examples of the detail needed to develop an operational HACCP plan will be of value in HACCP training. To fill this need, a team of HACCP trainers and persons experienced in the application of HACCP met to develop a series of HACCP plan examples, for use in teaching HACCP Principles and their application. It is the intent of these examples to show the relationship between prerequisite programs, preliminary steps, and HACCP Principles in developing a HACCP plan.

Four HACCP plans were developed as they might be for specific facilities: bulk Cheddar cheese, vacuum packaged beef franks for retail, frozen beef patties for food service, and frozen dough for food service. The different formats and levels of detail shown in the examples serve as guides in developing a HACCP plan. The plans were designed for use in HACCP training, and are *not* intended to be adopted and used as operational HACCP plans.

An introductory section provides background information about the HACCP plans that would not normally be found in the HACCP plan text. This includes the hypothetical conditions used in developing the four HACCP plans and some of the formatting features of each plan.

INTRODUCTION

In 1992, the National Advisory Committee on Microbiological Criteria for Foods (NACMCF) developed and adopted a document that described the concept of Hazard Analysis Critical Control Point (HACCP) and provided recommendations for applying the seven Principles (10). At about the same time, the Codex Alimentarius Commission was drafting a guideline for implementation of HACCP, which was functionally equivalent to the NACMCF document. In 1993, the Codex guideline was accepted at Step 8 of the Codex approval process, giving it virtually worldwide recognition (4). Also in 1993, Agriculture Canada (now Agriculture and Agri-Food Canada) announced its Food Safety Enhancement Program (FSEP), a voluntary program to promote the use of HACCP in its regulated industries (1). The FSEP is particularly noteworthy for its advancement of the concept of prerequisite programs. The concept of prerequisite programs was also included in the HACCP regulations promulgated by FDA (6) and USDA (8) and the recently revised Codex HACCP guidelines (5).

Today, HACCP is generally taught according to the NACMCF and Codex guidelines. However, the Principles of HACCP were intentionally written to allow flexibility. Although flexibility is an important strength of the HACCP concept, it also leaves the Principles open to differing interpretation and application.

To demonstrate an appropriate use of the Principles in particular commodities, organizations and individuals have published generic HACCP plans and HACCP models (e.g., see ref. 9). However, generic plans and models are usually developed to be relevant to a wide spectrum of processing environments. Therefore, generic plans and models generally lack the specificity in HACCP plans developed by establishments. Indeed, it is important that processors not mistake generic plans or models for operational plans. Operational HACCP plans must be developed specifically for the processing operation and facility.

Currently, there is a lack of published HACCP plans which are complete and can be used as examples of the detail needed to develop an operational HACCP plan for a specific facility. To fill this need, a team of HACCP trainers and persons experienced in the application of HACCP met to develop a series of HACCP plans, for use in teaching HACCP Principles and their application. It is the intent of these HACCP plans to show an application of prerequisite programs, preliminary steps, and HACCP Principles in developing a HACCP plan.

The following examples describe HACCP plans as they might appear for four fictitious plants, producing four different food products: bulk Cheddar cheese, vacuum packaged beef franks, frozen beef patties for foodservice, and frozen dough. The processes described in these papers are intended to simulate actual operations.

There are multiple ways by which these products could be produced, resulting in different HACCP plans. Even for the processes described here, different HACCP teams could be reasonably expected to develop different but equally effective HACCP plans. Much of the HACCP development process relies on expert opinion, and there may be differences of opinion, even among experts, as to the "right" HACCP plan for a process. Consequently, HACCP plans for similar processes may have different significant hazards, Critical Control Points (CCPs), critical limits, etc. Likewise, there is also no "right" format for a HACCP plan. Although there are similarities among the four HACCP plans presented in this series, each utilizes a different format. As is particularly evident in the frozen dough plan, which uses a "unit operation" approach.

Three of the HACCP plans include a list of the prerequisite programs considered important for successfully implementing the HACCP plan. Prerequisite programs are those basic, routine procedures controlling the operational conditions within a food establishment, that are necessary to produce safe and wholesome food (1). Prerequisite programs include many of the programs regarded as current Good Manufacturing Practices (cGMPs) (2, 3), although the cGMPs do not provide an exhaustive list, nor would all of the cGMPs necessarily be considered prerequisite for all HACCP plans.

The authors consider it important for the HACCP team to spend a sufficient amount of time ensuring that the prerequisite programs are adequately designed and implemented and that the other preliminary steps – description of product and distribution, intended use and identified consumers, and development and verification of the flow diagram – are sufficiently descriptive of the product and process. Doing so facilitates the performance of what

is generally recognized as being the most challenging aspect of HACCP – Hazard Analysis.

Prerequisite programs are managed outside of the HACCP plan. This is demonstrated in the beef frank and frozen beef patty plans by describing the prerequisite programs in a document separate from the HACCP plan. It is important to note that in some instances certain hazards, generally of lower likelihood and severity, can be effectively controlled by the prerequisite programs and therefore do not warrant inclusion in the HACCP plan. The HACCP plan cannot, and should not, be expected to control *all* hazards. Rather, it should be reserved for controlling significant hazards, i.e., those such that their elimination or reduction to acceptable levels is essential to the production of a safe food. Generally, those hazards controlled by the HACCP plan require a more intensive level of monitoring and a more immediate, direct response in the event of a deviation from critical limits. The significance of a deviation in a prerequisite program and the attendant level of response is generally not the same as that associated with deviations from critical limits at a CCP in a HACCP plan. With prerequisite programs, one is generally more concerned with deviations becoming a practice rather than one-time events.

However, such deviations require correction in a timely manner to prevent them from escalating into poor practice. Consistent maintenance of the prerequisite programs is important to the success of the HACCP plan. The plan's Hazard Analysis is developed with the expectation of a certain level of control afforded by these programs. Should the prerequisite programs not function at the expected level of control, the Hazard Analysis might no longer be valid, and the effectiveness of the HACCP plan could be in jeopardy. In the following examples, the HACCP team would have con-

ducted a review to assure proper design and implementation of these programs prior to design and implementation of the HACCP plan.

Each HACCP plan also includes a listing of the members of the HACCP team. This listing serves the dual purposes of documenting (1) the disciplines and operational responsibilities represented on the team, and (2) the individuals involved in writing the plan, should questions about the HACCP plan arise in the future.

A general product description, the intended use and distribution of the product, the expected consumers of the product, and a process flow diagram are included in each plan. In some plans, a brief text, describing the process, accompanies the flow diagram. This text includes information pertinent to the HACCP plan without cluttering the flow diagram. A plant schematic is included in the HACCP plan for vacuum packaged beef franks. Some HACCP plans include a plant schematic, showing the process flow through the facility. This is especially advisable if the processing environment or employee traffic flow has an impact on product safety. Like the review of prerequisite programs, these "preliminary steps" provide necessary information from which the Hazard Analysis is developed.

A written Hazard Analysis documents the potential hazards that were considered in each product and process, including which hazards were ultimately considered significant (i.e., need to be addressed in the HACCP plan) and why. In some HACCP plans, the Hazard Analysis includes a rationale for potential hazards that were considered, but not determined to be significant. This rationale will be important when the HACCP plan is reviewed to determine if it is still accurate and complete. The Hazard Analysis documents which methods were selected to control the significant hazards. Where important, a rationale is included to document why other control methods were

not selected.

HACCP trainers are encouraged to emphasize the importance of performing the Hazard Analysis *before* CCP selection. Too often, HACCP teams proceed directly from completing the preliminary steps to assigning CCPs, then step back to decide which hazards will be controlled at those CCPs. The resulting HACCP plans are often overloaded with unnecessary CCPs, controlling hazards which are not truly significant.

Some plans use text to document the Hazard Analysis, whereas others summarize the analysis in a table. For example, the table used in the bulk Cheddar cheese HACCP plan includes a stepwise view of the production process, the significant hazards at each step, the rationale for including or excluding a potential hazard as significant at that step, the method(s) selected for controlling the significant hazards at that step, and a column to document which steps were selected as CCPs.

In each HACCP plan, the team chose to use a HACCP summary table to describe each CCP and its respective hazard(s), critical limits, monitoring activities, corrective actions, record keeping and verification activities. This format has been used in generic HACCP plans published by NACMCF, USDA, and other organizations.

It is also essential that each HACCP plan is validated to demonstrate that what is written in the HACCP plan and implemented by the processor can actually prevent, eliminate, or reduce identified microbiological, chemical, and/or physical hazards to acceptable levels. Information which validates the HACCP plans is derived from various sources, including scientific literature, product testing, experimental research, scientifically based regulatory requirements, and information provided by persons with expert knowledge in hazard analysis. Revalidation of the HACCP plans is needed when a significant change has been made in the

process or product. In addition to the verification activities prescribed at each CCP, there are other activities which are important to assure the initial accuracy of the HACCP plan (i.e., validation), the consistent adherence of the HACCP system to the written plan (i.e., plan verification), and the continued effectiveness of the plan (i.e., revalidation or reassessment). These activities and their frequencies are described in the Cheddar cheese and beef frank HACCP plans.

These plans were written as they might be for specific facilities, and their formats and level of detail serve as a guide in developing a HACCP plan. The plans were designed for teaching and may be copied and used without copyright infringement. However, they are *not* intended to be adopted and used as operational plans. As stated earlier and reiterated here for emphasis, the contents of HACCP plans must be specifically developed for each facility's products and processes.

Some information important to understanding the HACCP plans is not normally included in the text of a HACCP plan. Since one intent of the following examples is to provide a format of how actual HACCP plans could appear and the logical process used in their development, it was decided to provide this supplemental information here. The following sections describe the hypothetical conditions used in developing these HACCP plans and highlight some of the formatting features of each plan.

BULK CHEDDAR CHEESE

This HACCP plan was prepared for a small (less than 50 employees), privately owned cheese manufacturer, which has been operating at a single facility for many years. The company manufactures several cheese products for bulk distribution to a number of customers in food service and food

processing. These customers further process the cheese (e.g., cutting into retail blocks or slices or as ingredients in process cheese) before it reaches the final consumer. All products are made to order. The company normally operates a single shift, five-day work week.

The facility has a limited technical staff. Product modifications, scheduling, production, cleaning and sanitizing are the responsibility of the cheese maker's staff. Equipment and facility maintenance are the responsibility of the Plant Engineer's Maintenance group. Quality assurance is also responsible for audits of plant cGMPs, personnel training in cGMPs, and compliance with regulatory requirements. Quality assurance is also responsible for a small, on-site laboratory, which performs antibiotic testing on raw milk and quality-related ingredient and finished product testing. The laboratory also performs some microbiological testing, including *Staphylococcus aureus*, as needed to support the HACCP plan.

Product is released only after batch records are reviewed and initialed by the company owner, who also serves as plant manager. The company has a good working relationship with an extension specialist at a local university. The extension specialist has served as a technical advisor to the company on a number of microbiological, chemical, and quality issues. Both the extension specialist and the quality assurance manager have received HACCP training. Technical advice is also obtained from the supplier of starter cultures and from certain major customers.

The HACCP plan was developed with the expectation that certain good manufacturing practices are consistently performed. These "prerequisite programs" are listed as an introduction to the HACCP plan. Operating procedures have been developed and responsibilities assigned for each prerequisite program. They are intended to assure compliance with current state and federal regulations, which

deal with issues of quality and prevention of adulteration.

The plant requires that every supplier of raw material provide a letter guaranteeing that all shipments comply with regulatory requirements and that periodically the supplier has materials tested by an outside laboratory. The scope of the HACCP plan is reflected in the process flow diagram. It extends only from receiving to shipping because the company has limited control over raw materials prior to their receipt and cannot control its product after shipping. However, these limitations were considered in the Hazard Analysis.

There are some aspects to the format which are particular to this HACCP plan. In addition to a Hazard Analysis text, the bulk Cheddar cheese plan utilizes a Hazard Analysis table to summarize the assessment at each process step. It is not necessary to include both; they are provided here for comparison. The table is consistent with tables recommended by FDA (7) and USDA (8) for a hazard analysis.

Tables are also included in the bulk Cheddar cheese plan to summarize the activities, frequencies, and responsibilities for evaluating the prerequisite programs and the HACCP system. Although similar tables are not included in all of the example plans, the activities described are recommended for all HACCP systems.

BEEF FRANKS, RETAIL

This HACCP plan was prepared for a USDA-inspected, medium-sized facility (50-100 employees). The parent company has manufactured processed meat products for many years. This facility is relatively new (ca. early 1980s) and was built by the parent company solely to produce frankfurters for regional distribution. The facility normally operates two shifts during a five-day work week to deliver a high volume of over six varieties of frankfurters (including non-beef). Product development and other

R&D functions are performed off-site at the company's technical center.

The facility's HACCP plans are developed on-site. The plan is reviewed by corporate Quality Assurance and R&D to provide consistency with company policies and to convey any information particular to the product formulation and process. Technical information, e.g., microbiology, toxicology, or processing, is available from the company's technical center.

The HACCP plan was developed with the expectation that certain prerequisite programs are in place and performed consistently. These programs are managed concurrently with the HACCP plan. Although not in the HACCP plan, adherence to these programs is still considered important to producing safe, wholesome, unadulterated products and for support of the HACCP plan.

One of the prerequisite programs cited is plant design and construction. As shown in the plant layout, the facility was designed for a unidirectional flow of materials: from the receiving dock and material storage, to formulation, through ovens and coolers, to packaging, storage and shipping. The plant layout is not ideal but is typical of many existing plants. For example, separate waste removal, parts wash, and dry and cold storage areas for separating raw materials and finished product have been provided. This design and employee adherence to a prescribed traffic flow are important for reducing the risk of cross-contamination of postcooking facilities and finished product by raw materials.

Product formulation and raw material specifications are developed by the parent company. The facility is responsible for purchasing raw materials but must use company-approved suppliers. Contract services, such as pest control, must also be provided by company-approved suppliers. These suppliers are periodically audited by the company's quality assurance department for conformance with the company's perfor-

mance standards.

Although raw materials are supplied by company-approved suppliers and finished product is shipped in company-owned trucks, the facility directly controls product safety only from raw material receiving to product shipping. These points define the scope of the plant's HACCP plans as reflected in the process flow diagram.

Each page of the beef franks plan is formatted to include the company's name and location (i.e., the establishment number). The first page includes the signature of the individual responsible for the establishment (i.e., the plant manager) and the date it was signed; these are required by USDA's HACCP regulation (8). Each page also indicates the product name and date on which the HACCP plan became effective. This similar notation minimizes opportunities for mix-up between HACCP plans and between different versions of the same HACCP plan.

FROZEN DOUGH FOR FOOD-SERVICE

This HACCP plan was developed for a large, complex processing operation. The facility makes a large number of flour-based products. All of these products are processed through most of the same processing equipment, i.e., each process uses the bulk flour handling system and a blending step but may or may not use one of several sheeting lines. Each process uses one of several packaging lines and the freezer warehouse. To develop a HACCP plan for each product, encompassing all of the actual processing variations, would generate an enormous amount of redundant documentation. Instead, this facility has taken a "unit operation" approach to HACCP.

By this approach, a HACCP plan was developed for each unit operation, analyzing the significant hazards that exist, the control measures, critical limits, etc. Each product formulation using these

operations was reviewed by the HACCP team to ensure that the sum of these unit operation HACCP plans control all of the significant hazards associated with manufacture of that product. An overall Product Description and Hazard Analysis Summary is included in the HACCP plan, although a written process description and hazard analysis could be included for each unit operation.

The unit operation approach is useful for simplifying a large plant's HACCP program and also for addressing complexities introduced by companies with multiple plants with similar systems producing multiple products. This HACCP plan provides an example of how the unit operation approach is used for one product or for twenty products using the same unit operations. A system for individual operation and plant identification is also demonstrated. In this example, the plant is number 9 and the unit operations are numbered 1 through 20. For simplicity, only unit operations of "Production Line 2" are carried through to completion.

This example uses separate forms for HACCP plan approval, HACCP team details, and HACCP plan history. Flow charts have been included only for the overall system and the two unit operations requiring CCPs for Production Line 2. In an actual HACCP plan using this approach and as implied in the plan's Table of Contents, there would be flow diagrams for each production line and unit operation and a HACCP plan for each unit operation with a significant hazard. However, should there be a need to review the HACCP plan for one particular product, this approach allows the facility to collate only those forms relevant to the product and present a simplified HACCP plan.

This example also demonstrates implementing a HACCP program as one part of an overall Quality Management System (QMS) based on ISO 9001. Some other elements of the QMS are Audits and Inspections; cGMPs; Chemical Control; Product Design; Product I.D. & Trace; Supplier Control;

Contract Manufacturing Control; Nonconforming Product Control; and Training. As with prerequisite programs in the other examples, these areas complement the HACCP program but are not a part of it.

FROZEN, RAW BEEF PATTIES FOR FOOD SERVICE

This HACCP plan was developed for a medium-sized, federally-inspected, privately owned company which produces a single product, 100% beef patties. The only product variable is size, 3 oz., 4 oz., and 8 oz. patties. This HACCP plan covers all size patties. The beef patties are distributed frozen only to restaurants and other food service establishments. None of the patties are retailed to the general public.

Because of recent outbreaks of foodborne illness from consuming hamburger patties prepared and served in a variety of settings, certain changes have occurred in this industry. For example, concern over potential enteric pathogens in ground beef has increased. One enteric pathogen, *E. coli* O157:H7, has been declared an adulterant in raw ground beef. This has led to microbiological specifications, testing programs for beef trim and finished patties, and requirements by some purchasers that suppliers of beef trim have HACCP plans well in advance of the dates specified in the USDA HACCP regulation (8). A variety of HACCP plans for raw ground beef patties have been developed to address the hazards. Revised time-temperature requirements for cooking ground beef patties have been developed and issued by FDA for food service establishments. These factors have all been considered by the authors in this example.

The scope of this HACCP plan begins with receipt of fresh, boneless beef and ends with shipment of frozen, raw beef patties. In the scope of this plan, there are no steps that can be controlled to reliably reduce the presence or number of microbial

pathogens in the raw meat as received. Although the prerequisite programs described assure that any pathogens do not proliferate, no step or combination of steps in the process are suitable as CCPs to prevent, eliminate, or reduce the enteric pathogenic organisms to acceptable levels. This is described in the Hazard Analysis.

As in the beef franks plan, this plan includes the USDA-required (8) signature of the responsible establishment individual and the date it was signed, although here the signature appears on the page of the HACCP summary table.

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In Memory of...

Dr. Genevieve Christen, a longtime member of IAMFES, passed away on April 1, 1997. She achieved bachelor's, master's, and Ph.D. degrees from the University of Missouri-Columbia and spent her life serving the food industry.

Her service in dairy and food science included positions in both corporate and academic arenas. Dr. Christen held the position of Associate Professor in the Department of Food Science and Technology at the University of Tennessee, a department to which she had contributed since 1986. In addition to her faculty responsibilities,

Genevieve was active in IAMFES, Institute of Food Technologists, The Tennessee Association of Milk, Water and Food Protection, and the U.S. National Committee of the International Dairy Federation. She was also a member of Alpha Zeta, Gamma Sigma Delta, Sigma Alpha, and Sigma Xi.

A scholarship has been established at the University of Tennessee in memory of Dr. Christen. Contributions may be sent to: The Genevieve Christen Scholarship, The University of Tennessee, c/o Food Science and Technology Department, P.O. Box 1071, Knoxville, TN 37901-1071.

Bulk Cheddar Cheese for Food Service or Further Processing

PREREQUISITE PROGRAMS

Before implementing this HACCP plan, the following plant-wide programs were evaluated by the HACCP team and shown to be adequate, functioning, and maintained. The firm conducts routine audits of the programs:

- plant layout, product flow, and employee traffic patterns, which minimize cross-contamination from raw material to post-pasteurization areas;
- potable water supply;
- pest control program;
- cleaning and sanitation SOPs;
- preventive maintenance program and SOPs for operating, maintaining, and calibrating equipment;
- recall procedure, including traceability of raw materials to supplier lots, coding for finished product, and traceability through distribution;
- SOPs for receiving and storing ingredients used in this product, including temperature control for bulk storage of milk;
- purchasing specifications and letters of guarantee for compliance with regulatory requirements;
- antibiotic testing program for incoming raw milk for regulatory compliance;

- SOPs for shipping/distributing product, including preventing cross-contamination from transportation vehicles (i.e., back hauling) and temperature specifications for vehicles; and
- training programs for personnel in general hygienic practice and implementation of this HACCP plan.

Because the hazard analysis was developed with the expectation that these programs are continuously in place and functioning, these programs are essential to the reliable functioning of the HACCP plan.

HACCP TEAM

O. P. Everin, owner and plant manager; Y. L. Czerny, cheese maker; S. C. Lawrence, quality assurance manager; F. F. Smith, plant engineer; W. C. Cole, university extension specialist (technical advisor to the firm).

PRODUCT DESCRIPTION AND DISTRIBUTION

Cheddar cheese is prepared from the following ingredients in order of predominance: milk, non-fat dry milk (NFDM), sodium chloride, starter culture (commercially obtained), rennet (microbio-

logically derived), calcium chloride (CaCl_2), and color (annatto). Cheese is packaged into 640 lb blocks in waxed, wooden boxes. Cheese is aged in these boxes at 40° to 45°F for 4 to 12 months, according to customer specifications, and then is shipped in refrigerated (35° to 40°F) trucks.

INTENDED USE AND CONSUMERS

Product is intended for food service or ingredient use. Some customers will use this product without further processing.

PROCESS DESCRIPTION

Raw milk is purchased from a local milk broker and is received in refrigerated tanker trucks. After receiving, raw milk is stored in refrigerated (40° to 45°F) silos for up to three days. All other ingredients are shelf-stable. These are purchased and stored on-site in an unrefrigerated warehouse. Non-dairy liquid ingredients are dispensed according to batch size. Starter is purchased in single batch units. NFDM and salt are used as needed to meet product specifications. No rework is used.

At the start of the batch, raw milk is metered through a closed system to the separator/clarifier, which removes a portion of the

Note: This plan was developed for training purposes only; this is not an actual HACCP plan.

cream into a blend tank. Removed cream is metered to the blend tank to meet product specifications. Excess cream is piped to a sanitized tank for storage and non-Cheddar cheese use. NFDM is added manually to the blend tank to meet product specifications. Ingredients are blended for 15 min.

The contents of the blend tank are preheated through a product regenerator, HTST pasteurized, cooled, and pumped into the temperature-controlled cheese vat in the cheese make room. A portion of the pasteurized blend is diverted to a small starter culture vat. Dry starter culture is manually added and rehydrated in the starter culture vat. The starter culture vat is held at 90° to 95°F for 2 h, according to the starter supplier's directions, before manually adding it to the cheese vat. The starter is mixed into the blend with an automated system of rotating stainless steel paddles.

The cheese vat is held at 86° to 88°F, and the blend ripens. The titratable acidity (TA) normally increases at least 0.02% within 1.0 h. Slow ripening is corrected by the cheese maker. When TA reaches 0.02%, color, rennet, and CaCl₂ are manually added and mixed into the blend using the automated system of rotating stainless steel paddles.

The vat is held without agitation while the curd forms during the next 2 h. The cheese maker continues to monitor acid development. The curd is cut in the vat with wire "knives". The vat temperature is raised and the curd is heated to 95°F. This shrinks the curd, and the expressed whey is drained out of the vat. Drained curd is cheddared in the vat. After cheddaring, the curd is mechanically milled in the vat. Salt is added by hand. When the product has reached the desired consistency, the curd is moved out of the vat on a conveyor, through a metal detector, and filled into waxed, 640 lb wooden boxes. Pressure is applied, and the boxes are stored in a 40° to 45°F room. The cheese

is aged according to customer specifications. After ageing, the cheese is either held in refrigerated (35° to 40°F) storage or shipped directly to the customer in refrigerated trucks.

HAZARD ANALYSIS

The hazard analysis was conducted by considering the likelihood of occurrence and severity of each potential hazard in order to determine which hazards were significant enough to be addressed in the HACCP plan. In conducting this analysis, the team considered that, historically, Cheddar cheese made from pasteurized milk has not been a source of salmonellosis. However it has been linked to sporadic outbreaks of staphylococcal food poisoning due to post pasteurization contamination and growth. Recent history indicates that the problem of staphylococcal food poisoning from this source has been effectively addressed through adoption by the industry of HACCP-type control measures similar to those outlined in this HACCP plan.

Ingredients

Raw milk is considered a significant source of biological hazards, such as *Salmonella* and other enteric pathogens. In the past ten years, the risk of enteric pathogen contamination in NFDM has been negligible. However, isolated incidents of *Salmonella*-contaminated NFDM have occurred. Therefore, the firm's technical advisor has recommended that NFDM be treated as a potential source of *Salmonella*. Pathogens from both sources are controlled by pasteurization before addition to the cheese vat.

The only chemical hazard warranting consideration is antibiotic residues, which under certain circumstances cause an acute, allergic reaction. Based on a review of available literature, the firm's technical advisor concluded

that the residue levels which reasonably occur in Cheddar cheese pose no significant allergen hazard. Antibiotic residues, however, inhibit the starter culture and, thereby, increase the risk of antibiotic resistant *Staphylococcus aureus* growth and enterotoxin production. The concern for antibiotic residues is effectively controlled by our prerequisite residue testing program and working with our supplier of milk. In the unlikely event that a slow vat occurs because of antibiotic residues, it is controlled in the same manner as slow vats from other causes (see below).

The nature of the ingredients results in a low risk for physical hazards.

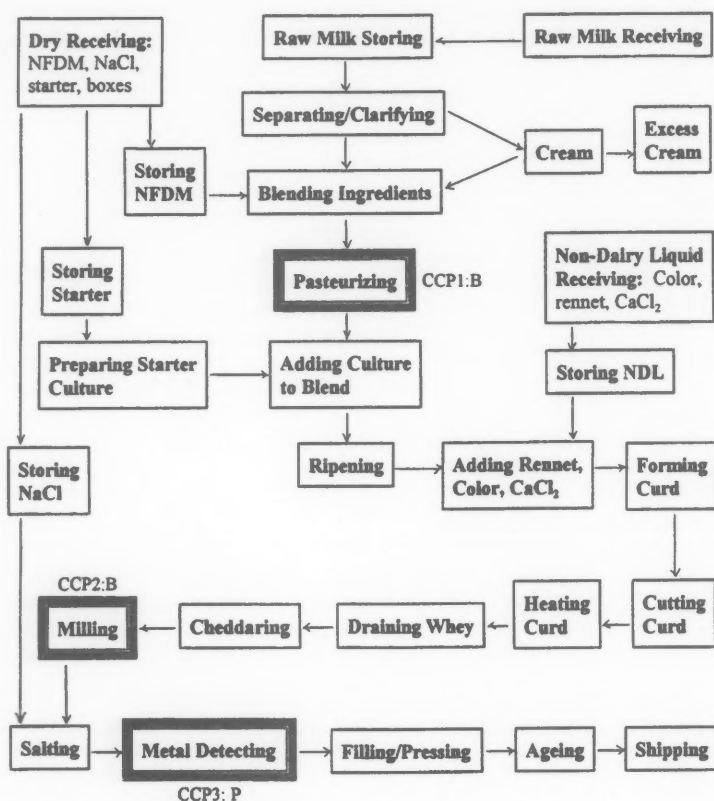
Process

After pasteurizing and cooling to a nonlethal temperature, the milk blend is susceptible to recontamination with enteric pathogens. A review of available literature has not revealed a history of problems from this source, and this risk is considered minimal while sanitation SOPs are in place and followed. Thus, product testing for pathogens is not performed. Finished product conditions inhibit the growth of pathogens.

Incidental product contamination with *S. aureus* may occur from a number of sources after pasteurization. Acid production is essential to prevent staphylococcal growth and enterotoxin production. The rate of acid production is as important as the final quantity of acid produced. Thus, slow vats are as much of concern as dead vats. It is important to identify atypical vats of cheese so that subsequent corrective actions are taken (e.g., testing the cheese for *S. aureus* concentration and, if necessary, enterotoxin).

The production of acid is monitored in the cheese vat by measuring titratable acidity. This information is available to the cheese maker and influences the

Bulk Cheddar Cheese



cheese maker to adjust the process, if necessary. The cheese maker has several operating guidelines available for adjusting the process. Factors that influence the rate and final quantity of acid produced include activity and amount of starter culture, phage contamination, temperature of milk in the vat, and the amount of heat applied when heating the curd.

Ultimately, at least a minimum amount of acid must be developed within a maximum time period to assure the safety of the product.

The HACCP team elected to use the Milling step when the curd is cut before salting, as a CCP for monitoring process control. At this point, there is a critical limit for product pH (i.e., minimum level of acid production) and time (i.e., maximum time allowed for adequate acid production). Vats, which are low in acid (high in pH) at the time of milling or which were slower than normal in acid development, are suspect and should be subsequently examined for *S. aureus*.

In-plant contamination with chemicals (e.g., cleaners, sanitizers, lubricants) is minimal while GMPs and cleaning and sanitation SOPs are in place and followed. Adequacy of these programs is verified by daily equipment inspections and periodic plant audits.

Personnel training in GMPs helps to minimize physical hazards from entering the product after pasteurization. Metal fragments from equipment fatigue are a potential hazard. As a precaution, a metal detector checks the cheese curd just prior to filling into boxes. Although the firm chose to use a metal detector for this purpose, alternative methods (e.g., equipment inspection, preventive maintenance) to control contamination are important prevention steps.

A summary of the hazard analysis of each process step, rationale for hazard significance, control measures and identification of critical control points is presented in Table 1.

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TABLE 1. Hazard Analysis, Control Measures, and CCPs

Process step	Significant hazards	Rationale/Control measures	CCP?
Dry receiving (NFDM, salt, starter, boxes)	<i>Salmonella</i> (NFDM)	NFDM may contain <i>Salmonella</i> which is controlled by pasteurizing. Salt, commercial starter culture, and the packaging material (waxed, wooden boxes) historically have not been significant sources of biological hazards. None of these materials is considered a significant source of chemical or physical hazards.	No
Storing NFDM, starter	None	Materials are shelf-stable and wrapped or stored in intact containers.	No
Receiving non-dairy liquids (calor, rennet, CaCl ₂)	None	Microbially derived rennet is used. All materials are food grade. No biological, chemical, or physical hazards are likely to be introduced or increased.	No
Storing non-dairy liquids	None	All materials are shelf-stable and stored in intact containers.	No
Raw milk receiving	Pathogens	Raw milk may contain enteric pathogens. These are controlled by pasteurizing. Raw milk may contain antibiotics. However, a hazard assessment, based on likelihood of occurrence and severity, indicates that antibiotics do not pose a significant hazard to public health. Raw milk is unlikely to contain other chemical hazards.	No
Raw milk storing	Pathogen growth	Temperature abuse may allow growth of pathogens present in the raw milk. Control of raw milk storage is included under plant (prerequisite) programs. However, any growth due to loss of temperature control is controlled by subsequent pasteurization. If milk is temperature abused, such that pathogens grow to levels able to survive pasteurization, the quality of the milk is unusable due to spoilage. Risk of contamination by chemicals used for cleaning or sanitation, here or in subsequent process steps, is low while programs are in place for adherence to sanitation SOPs and GMP training of personnel. Risk of in-plant contamination with physical hazards (e.g., cleaning brushes, glass, personal effects), here or in subsequent process steps, is low while programs are in place for GMP training of personnel and adherence to equipment maintenance procedures.	No
Separating/Clarifying	None	No biological, chemical or physical hazards are likely to be introduced or increased.	No
Adding back cream	None	Cream is not stored, so no biological, chemical or physical hazards are likely to be introduced or increased. The cream is added before pasteurization.	No

(Continued) TABLE 1. Hazard analysis, control measures, and CCPs

Process step	Significant hazards	Rationale/Control measures	CCP?
Blending ingredients	None	Product flow, after raw material storage through blending, is typically a few minutes and never more than 4 h. Even if raw materials containing pathogens are held for the maximum time, the cold milk blend does not warm at a rate, or to a temperature, which allows pathogens to grow to levels that can survive pasteurization. No chemical or physical hazards are likely to be introduced or increased.	No
Pasteurizing	Pathogen survival	Proper delivery of the thermal process is critical to destroy enteric pathogens in the raw materials. In the regenerator, after pasteurization, the product cools to nonlethal temperatures. Risk of product recontamination at this and all subsequent steps is low while programs are in place for adherence to sanitation SOPs at post-process food contact surfaces. Risk of product recontamination in the regenerator is low while program is in place for pasteurizer maintenance and appropriate pressures are maintained. No chemical or physical hazards are likely to be introduced or increased.	Yes
Preparing starter culture	None	Use of pasteurized blend as a starter medium and the low potential for biological hazards in the starter culture make it unlikely that pathogens are introduced at this point. No chemical or physical hazards are likely to be introduced or increased.	No
Adding culture to blend	Pathogen recontamination with <i>S. aureus</i>	Incidental product contamination with <i>S. aureus</i> may occur from a number of sources after pasteurization. Such contamination is controlled by proper acid development. Risk of product recontamination with enteric pathogens at this and all subsequent steps is low while programs are in place for adherence to GMPs and sanitation SOPs. No chemical or physical hazards are likely to be introduced or increased.	No
Ripening	<i>S. aureus</i> growth and enterotoxin production	Proper acid development, beginning at this step, is critical to assuring <i>S. aureus</i> control. If necessary, the cheese maker adjusts the process. Final assurance of proper acid development is monitored at Milling.	No
Adding rennet, color, CaCl ₂	None	These raw materials are not significant sources of hazards. The process of adding them to the batch is not likely to introduce a hazard.	No
Farming curd	None	No biological, chemical or physical hazards are likely to be introduced or increased.	No
Cutting curd	Metal	Wires used to cut the curd may break. Metal detection is critical for hazard control.	No
Heating curd	<i>S. aureus</i> growth and enterotoxin production	Heating is too low to reduce pathogen risk. Overheating can slow fermentation process by inactivating the starter culture. Acid development is checked throughout fermentation, but must meet limits at Milling.	No
Draining whey	None	No biological, chemical, or physical hazards are likely to be introduced or increased.	No
Cheddaring	None	No biological, chemical, or physical hazards are likely to be introduced or increased.	No

(Continued) TABLE 1. Hazard analysis, control measures, and CCPs

Process step	Significant hazards	Rationale/Control measures	CCP?
Milling	<i>S. aureus</i> growth and enterotoxin production	This is the last step at which adequate acid development is checked. Inadequate acid at this step increases the risk of <i>S. aureus</i> growth through Pressing. Suspect lots are held for testing.	Yes
	Metal	Milling equipment may break. Metal detection is critical for hazard control.	Na
Salting	None	Any <i>S. aureus</i> introduced during manual salting is controlled by proper acid development, which is monitored at Milling. No chemical or physical hazards are likely to be introduced or increased.	Na
Metal detecting	Metal	This is the last step at which any metal is detected and removed.	Yes
Filling and pressing in box	None	No hazards are introduced.	Na
Ageing	None	After cheese is packaged, recontamination risk is low.	Na
Shipping	None	Refrigeration is needed for product quality, e.g., to prevent oil separation. Temperature abuse of Cheddar cheese has not been associated with foodborne illness.	Na

TABLE 2. HACCP plan summary

CCP	Hazard	Critical limit	Monitoring	Corrective action	Record keeping	Verification
Pasteurizing	Enteric pathogens	≥ 161°F/15 s, as per Pasteurized Milk Ordinance	Pasteurizer operator checks seals on timing pump daily.	If timing pump seal is broken or if measured flow rate exceeds critical limit, process is not run until pump is recalibrated and seal is replaced.	Operator log including recorder chart with pasteurizer operator's initials and data entered on chart regarding agreement or adjustments between MIG indicating thermometer and chart recorder; log of MIG readings; and flow rate monitoring results. Daily record of divert valve operation. Thermometer and timing pump calibration records. Pasteurizer maintenance records.	Pasteurizer operator checks max flow rate by Flow Rate Check (SOP) daily.
			Hold tube exit temperature is continuously measured on chart recorder. Pasteurizer operator checks and initials agreement between chart recorder and mercury-in-glass (MIG) indicating thermometer.	If hold tube exit temperature is less than critical limit, system automatically diverts milk to reprocess. If necessary, operator readjusts process temperature.		QA verifies divert and alarm functions quarterly and after maintenance.
			Pasteurizer operator checks proper operation of divert function at start-up.	If critical temperature limit is not met and divert valve fails, milk is repasteurized or dumped.		Indicating thermometer and chart recorder are calibrated monthly by Maintenance, according to plant SOP based on PMO procedures.

(Continued) TABLE 2. HACCP plan summary

CCP	Hazard	Critical limit	Monitoring	Corrective action	Record keeping	Verification
Metal detecting	Metal	Operable metal detector on.	All product passes through detector before fill/press step.	If metal is detected, the process line stops. Product is manually diverted by operator and held for evaluation for metal.	Operator lag, indicating time of metal detector sensitivity checks and results.	Metal detector sensitivity is verified weekly by QA.
		No metal detected.	Fill operator checks every 2 h of operation to ensure detector is on and can detect metal standard.	Fill operator prepares deviation report, determines source of metal, and identifies appropriate corrective action. If metal is due to an equipment maintenance problem, Maintenance is informed.	Deviation reports, indicating lot and time when metal was detected or detector failed, results of evaluation, corrective action, and disposition of product.	Supervisor reviews operator lags daily, deviation reports weekly.
Milling	<i>S. aureus</i> growth	pH ≤ 5.60 by 8 h after adding culture to milk	QA tests product pH of every vat by Cheese pH Testing SOP.	If pH > 5.60, sample cheese after Pressing and test for <i>S. aureus</i> counts by FDA BAM procedure.	Batch records, indicating product pH.	QA calibrates pH meter before each use.
				If <i>S. aureus</i> counts ≥ 10 ⁴ but < 10 ⁵ , then consider suitability of cheese for use in thermally processed product.	All Corrective Action reports, including product pH, <i>S. aureus</i> counts, SET test results, and product disposition.	QA periodically verifies SET test accuracy.
				If <i>S. aureus</i> counts ≥ 10 ⁵ , test for staphylococcal enterotoxin (SET): <ul style="list-style-type: none"> • If SET positive, destroy product. • If SET negative, then use in thermally processed product. 		QA performs positive control test on each new batch of <i>S. aureus</i> enumeration medium.

TABLE 3. Prerequisite program evaluation schedule

Activity	Frequency	Responsibility	Reviewer
Evaluation of prerequisite programs	Prior to HACCP plan development	HACCP Team	Plant Manager
	Semiannually or upon program or compliance deficiency	Quality Assurance	HACCP coordinator Plant Manager
Records review for prerequisite programs	Weekly	Appropriate Operations Supervisor	Quality Assurance

TABLE 4. Cheddar cheese HACCP system verification schedule

Activity	Frequency	Responsibility	Reviewer
HACCP verification scheduling	Yearly or as needed (see below)	HACCP coordinator	Plant Manager
Validation of HACCP plan	During HACCP plan implementation	Quality Assurance or third party HACCP auditor*	HACCP Team
Batch records review, including Monitoring and Corrective Action records	Prior to shipping product lot: monitoring records, daily; Corrective Action records, weekly	Appropriate Operations Supervisor	Plant Manager
Additional CCP verification activities	See HACCP plan	See HACCP plan	Plant Manager
HACCP system verification/audit	Semiannually, or upon compliance, or system failure, or significant change	Quality Assurance or third party HACCP auditor*	HACCP Team
HACCP plan revalidation	Yearly or when significant changes are made	HACCP Team	Plant Manager

* Reviewers other than the team writing and implementing the plan.

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A Microbial Survey of Office Coffee Cups and Effectiveness of an Office Cup Washer for Reduction of Bacteria

Ralph R. Meer,^{1*} Charles P. Gerba,^{2,3} and Carlos E. Enriquez²

SUMMARY

The purpose of this study was to: 1. assess the concentration and types of bacteria found in office coffee cups and in coffee preparation areas and 2. evaluate the ability of a small coffee cup washer, designed for office use, to reduce bacteria levels on coffee cups. The concentrations and occurrence of coliform bacteria in office coffee preparation areas (e.g., counters, drains/sinks, washcloths, sponges, and coffee spoons) were found to be similar to that found in household kitchens. The numbers of bacteria in "clean" (i.e., no heavy brown film) and "used" coffee cups averaged (geometric mean) 1.1×10^2 (range 0 to 4.5×10^3) and 2.6×10^4 (range 5.4×10^3 to 3.0×10^5) colony forming units (CFU), respectively. Bacterial types identified in the cups included *Citrobacter freundii*, *Enterobacter agglomerans*, *Enterobacter cloacae*, *Klebsiella oxytoca*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Pseudomonas cepacia*, *Serratia liquefaciens*, and *Serratia marcescens*. While these bacteria do not usually cause illness in healthy individuals they may cause infections in immunocompromised individuals. Forty-one percent (22/53) of all cups contained coliform bacteria. Wiping the cups with a moist sponge or dish cloth resulted in a significant increase in bacterial contamination of the cups in addition to cross-contamination with *Escherichia coli* and other coliforms. It was demonstrated that a small, office cup washer completely eliminated coliforms and most other heterotrophic bacteria.

INTRODUCTION

In addition to its economic burden, foodborne illness continues to have a significant impact on morbidity in the United States. It is generally believed that the majority of foodborne illnesses occur as small, sporadic outbreaks in homes (1, 6). Cross-contamination and improper cleaning of equipment and utensils have been identified as factors contributing to the occurrence of foodborne disease outbreaks (1, 2, 4, 7, 10). Domestic surveys have identified kitchen areas and items such as counters, sinks, dish cloths, sponges, and tea towels as reservoirs and/or disseminators of potentially pathogenic bacteria (3, 5, 9, 12, 13). However, no previous studies have been conducted on the microbial content of coffee cups in the office environment. Many office and other work establishments have food or coffee preparation areas set aside for employees. To our knowledge microbial surveys have not been conducted in these areas. Factors associated with these areas that may contribute to foodborne illness include community usage, knowledge deficit concerning the potential for coffee cups and other non-food items in the kitchen to harbor potentially pathogenic bacteria

and lack of routine cleaning and sanitary measures. The presence of moisture and food particles in these environments may allow disease-causing enteric bacteria to persist for prolonged periods and even grow to large numbers. The purpose of this study was to determine the numbers and types of bacteria in office coffee preparation areas and coffee cups and evaluate the ability of a small coffee cup washer designed for office use to reduce bacteria levels on coffee cups.

MATERIALS AND METHODS

Microbial survey of coffee preparation areas

Ten office coffee preparation areas at the University of Arizona were selected for sampling. The selection of coffee preparation areas for participation in this survey was based on the presence of a sink in the coffee preparation area and relative proximity to the analysis laboratory. The coffee preparation areas surveyed were found in six different campus buildings, principally, but not limited to agriculture-related disciplines. At each site separate sterile swabs, dampened with sterile phosphate buffer solution (PBS), were used to sample dirty and clean ceramic coffee cups, as well as counter and sink areas. After swabbing each site, the swab was placed into separate 5-ml volumes of PBS. In addition, water from a dish cloth or dish sponge, if available, was also sampled. If needed, the dish cloth or sponge was made wet with tap water. Microbial analysis of samples was completed within 2 h after sampling. Falcon[®], polystyrene test tubes (Becton Dickinson & Co., Paramus, NJ) containing the swab and buffer or water collected from the dish cloth or sponge samples were vortexed prior to making 10-fold dilutions in 1.0% peptone (Difco Laboratories, Detroit, MI). Heterotrophic plate counts (HPC) were determined by the spread plate method on tryptic soy agar (TSA) (Difco) followed by incubation at 37°C for 24 to 48 h. Detection of total coliforms and

Escherichia coli was performed using Colilert[®] (IDEXX Laboratories, Inc., Westbrook, ME). Swabs from the above samples were inserted into Colilert[®] tubes containing 10 ml of sterile, dechlorinated tap water. Colilert[®] tubes were considered positive for coliforms following the development of a yellow color throughout the tube after incubation at 37°C for 24 h. The same tubes were then evaluated for fluorescence (positive for *E. coli*) after exposure to ultraviolet (UV) light (365 nm) using a hand-held UV lamp.

Coliform analysis of coffee cups using a 10-ml wash

To improve the recovery of coliforms from the ceramic coffee cups, a 10-ml wash solution (sterile, dechlorinated tap water) was poured into the coffee cup, mixed with a sterile swab, and then poured into the Colilert[®] tube followed by incubation and analysis as above.

Identification of selected isolates

In addition to TSA, samples were plated on m Endo and m FC agar (Difco), using the spread plate method, to select for coliforms and fecal coliforms, respectively. The m Endo plates were incubated at 37°C and the m FC plates at 44.5°C for 24 to 48 h. Isolates obtained from TSA, m Endo and m FC agar plates were streaked onto TSA plates. Isolated colonies from the TSA plates were suspended in 5 ml of 0.85% NaCl. Aliquots of the cell suspensions were then used to inoculate the tube and/or capsule sections of API 20 E strips (bioMérieux Vitek, Inc.). The strips were incubated at 37°C for 24 h. Results were read according to the manufacturer's directions.

Microbial transfer from dish cloth or sponge to ceramic coffee cups

In order to evaluate the ability of dish cloths or sponges to cross-contaminate ceramic coffee cups, cups were surveyed before and after contact with an available dish cloth or sponge. Sterile, dechlorinated tap water (10 ml) was poured

into the ceramic coffee cup and mixed with a sterile swab. The solution was then collected, and diluted 10-fold with 1.0% peptone, and plated on TSA for the heterotrophic plate count. The wash solution was also analyzed for total coliforms and *E. coli* by using Colilert[®]. Next, the wash cloth or sponge was used to wipe the inside of the coffee cup; tap water was used to wet the cloth or sponge if it was dry. The coffee cup was then rinsed once with tap water and resampled as described above.

Evaluation of an office cup washer to reduce microbial contamination of ceramic coffee cups

Cups were surveyed before and after being washed in the FreshCUP[®] System, (Deeay Technologies, Ltd., Israel) a small office coffee cup washer. The FreshCUP[®] System uses hot (60°C) water and a proprietary "hygienic" detergent mix, containing detergent and sanitizer. Prior to washing, 10 ml of sterile, dechlorinated tap water was poured into the ceramic coffee cup and mixed with a sterile swab. The 10-ml wash solution was then collected, diluted with 1.0% peptone, and plated on TSA for the heterotrophic plate count. The wash solution was also analyzed for total coliforms and *E. coli* by using Colilert[®]. The coffee cups were then placed in the FreshCUP[®] System for washing on the normal cycle. After completion of the regular (30-s) cycle, the coffee cups were removed from the wash basket and placed upside-down on top of the unit designed as a drainer. The coffee cups were allowed to drain dry in this position for 10 min prior to sampling and analysis as described above.

RESULTS

The microbial survey of office coffee preparation areas and coffee cups is summarized in Table 1. High numbers of bacteria were found in the sink area, on counters, and on dish cloths or sponges. Coliforms were found in the coffee preparation areas with the highest

TABLE 1. Summary of microbial contamination of office coffee preparation areas

Item sampled	Heterotrophic plate count ^a		Coliforms ^b (% positive)	<i>E. coli</i> ^c (% positive)
	average ^d	range		
Dirty cups ^e	2.6×10^4	5.4×10^3 to 2.8×10^5	75	0
Clean cups ^e	1.1×10^2	0 to 4.5×10^3	21	0
Counters	2.3×10^3	1.1×10^2 to 4.0×10^4	10	0
Drain/sinks	3.1×10^6	1.7×10^4 to 7.1×10^7	80	40
Wash cloths	2.2×10^5	3.1×10^4 to 7.9×10^6	67	0
Sponges	3.0×10^6	8.1×10^3 to 3.2×10^7	80	20
Coffee spoons	1.6×10^2	30 to 8.1×10^2	50	0

^aHeterotrophic plate count: CFU/ml of resuspension buffer plated on tryptic soy agar.

^bColiforms were identified by using Colilert[®]; development of a yellow color was considered positive.

^c*E. coli* was also identified by using Colilert[®]; fluorescence under UV light was considered positive.

^dAverage was calculated as the geometric mean.

^eAll cups surveyed were ceramic coffee cups.

TABLE 2. Summary of microbial contamination of coffee cups by dish cloths and sponges

Sample	Heterotrophic plate count per ml wash		Percent Positive	
	Average ^a	Range	Coliforms ^b	<i>E. coli</i> ^c
Before wiping	6.5×10^2	60 to 3.9×10^5	20	0
After wiping	7.0×10^5	7.3×10^4 to 5.5×10^7	100	20

^aAverage was calculated as the geometric mean.

^bColiforms were identified using Colilert[®]; development of a yellow color was considered positive.

^c*E. coli* was also identified using Colilert[®]; fluorescence under UV light was considered positive.

prevalence, 80% (8 of 10), in both drain and sink areas and on sponges. Forty percent (4 of 10) of drain and sink areas and 20% (1 of 5) of sponges were positive for *E. coli*. The numbers of bacteria in "clean" and "used" coffee cups averaged (geometric mean) 1.1×10^2 (range, 0 to 4.5×10^3) and 2.6×10^4 (range, 5.4×10^3 to 3.0×10^5) colony-forming units (CFU)/ml resuspension buffer (PBS), respectively. Using the swab sampling

technique, it was observed that 19% (4 of 21) of clean and 43% (3 of 7) of dirty coffee cups contained coliform bacteria. Using a 10-ml sterile wash of the coffee cups in place of the sterile swab method to survey an additional 25 coffee cups, it was found that 25% (3 of 12) of clean and 92% (12 of 13) of dirty coffee cups contained coliforms. *E. coli* was not identified in any of the coffee cups surveyed. Bacterial types identified in the

cups included the coliforms *Citrobacter freundii*, *Enterobacter agglomerans*, *Enterobacter cloacae*, *Klebsiella oxytoca*, and *Klebsiella pneumoniae*. Additional opportunistic pathogens, including *Pseudomonas aeruginosa*, *Pseudomonas cepacia*, and *Serratia liquefaciens*, were also identified.

The data on the ability of dish cloths and sponges to cross-contaminate coffee cups is summarized in Table 2. The heterotrophic bacteria counts on coffee cups before and after wiping with dish cloths or sponges averaged (geometric mean) 6.5×10^2 (range, 60 to 3.9×10^5) and 7.0×10^5 (range, 2.0×10^4 to 5.5×10^7), respectively. Coliform bacteria were present on 20% (2 of 10) of the coffee cups before and 100% of the cups after wiping with a dish cloth or sponge. No *E. coli* was found on cups prior to wiping. However, 20% (2 of 10) of coffee cups were positive for *E. coli* after wiping.

The ability of the FreshCUP[®] System to reduce bacterial contamination of coffee cups is evident from the data in Table 3. The heterotrophic plate counts averaged (geometric mean) 6.4×10^2 (range, 4 to 2.4×10^5) CFU/ml of wash solution before washing in the FreshCUP[®] System and 3.0 (range, 0 to 48) CFU/ml after washing. No coliforms were identified from the washed cups, while 36% (9 of 25) of the unwashed cups contained coliforms. No *E. coli* was found on either the washed or unwashed cups.

DISCUSSION

This study confirms the presence of enteric and opportunistic pathogenic bacteria in the food-preparation environment (Table 1). High numbers of bacteria were detected in the sink areas, on counters, and on sponges and dish cloths. Coliforms and *E. coli* were also detected, indicating insanitary conditions. Other studies have identified kitchen items and areas as potential reservoirs and/or disseminators of enteric organisms. Finch and coworkers (5) identified

TABLE 3. Effect of FreshCUP® System on bacterial reduction

	Heterotrophic plate count		Percent positive	
	Average ^a	Range	Coliforms ^b	<i>E. coli</i> ^c
Before washing	6.4 × 10 ²	4 to 2.4 × 10 ⁵	36	0
After washing	3.0	0 to 48	0	0

^aAverage was calculated as the geometric mean.

^bColiforms were identified using Colilert®; development of a yellow color was considered positive.

^c*E. coli* was also identified using Colilert®; fluorescence under UV light was considered positive.

enteric organisms including *E. coli*, *Klebsiella pneumonia*, *Citrobacter* sp., and *Enterobacter* sp. on sinks, sink drains, and dish cloths in homes. A study done by Scott et al. (11) on homes in England identified *Enterobacter* sp. from 56.5% of sinks, 50.4% of dish cloths, and 10% of cutlery and crockery items, with *E. coli* being the most prevalent: it was identified on 18.7%, 13.5% and 2.0% of the above test sites, respectively. In contrast, a study done by Speirs et al. (12) found no coliforms on cutlery and crockery items, although coliforms were found on 30.8% of dish cloths and 26.8% of sinks. *E. coli* was also identified from 4% of the sinks. This study demonstrated that significant cross-contamination of coffee cups occurred after wiping with a contaminated dish cloth or sponge (Table 2).

Although no *E. coli* were detected on any coffee cup, coliforms were found in 75% of dirty or used coffee cups and on 21% of "clean" cups contained coliforms (Table 1). While previous studies have not looked at office coffee cups specifically, Schindler and Metz (8), surveyed beer mugs cleaned in open vats or on conveyor-belt dishwashing machines. Ten or more total and fecal coliforms were found in 30.3 and 4.7% of the machine-washed mugs versus 67.6 and 12.1% of the vat-washed beer mugs, respectively.

The FreshCup® System relies on chemical sterilization, although the type and concentration of chemical

was not revealed by the company, instead of hot water sterilization (82°C) to reduce the number of bacteria in coffee cups by more than 99% (determined by using the geometric mean or greater than 99.9% using the arithmetic mean; data not included) or to undetectable levels. No coliforms were detected on coffee cups after cleaning with the FreshCup® system.

Additional areas of research may include cost and efficiency comparisons with other methods for cleaning of coffee preparation areas, equipment and utensils and the relationship between the sanitary condition of coffee cups and its potential effect on the health of employees.

CONCLUSION

The presence of insanitary conditions in office kitchen and/or coffee preparation areas is of concern. The presence of potential pathogens in this environment necessitates the initiation of proper sanitary standards. Bacterial contamination of used coffee cups has been demonstrated to occur in the workplace. This contamination can be eliminated or reduced significantly by the use of a small office cup washer.

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Jenny N. Scott

SCOTT ELECTED SECRETARY

Robert Tiffin, Chairperson of the IAMFES Teller's Committee has announced that Jenny Scott was elected Incoming Secretary of the Association. Ms. Scott will take office following the Awards Banquet at the 1997 Annual Meeting and will succeed through Executive Board Offices, serving as the Association's President in 2000-2001.

Virginia (Jenny) Scott began her career as a Research Specialist for the Food Research Institute at the University of Wisconsin before joining the National Food Processors Association (NFPA) as a Senior Microbiologist in 1980. During her sixteen years with NFPA she has held several positions including her recent promotion to Senior Director, Office of Food Safety Programs.

As Senior Director, Jenny assists in the coordination of food safety issues at NFPA, including legislative, regulatory and international aspects. She also provides expertise in microbiology, HACCP, ISO 9000, risk

assessment and other areas to NFPA members and staff as well as serves as Staff Secretary to the Microbiology and Food Safety Committee.

Jenny is an active member of IAMFES and has participated on the Program Advisory Committee and the Nominating Committee. She continues to be involved with the Meat Safety and Quality Professional Development Group, Risk Assessment Professional Development Group, and has convened sessions at IAMFES Annual Meetings. Other affiliations are with the Institute of Food Technologists, American Society for Food Microbiology, Association of Official Analytical Chemists, U.S. Delegation of the Codex Committee on Food Hygiene and the International Life Sciences Institute's (ILSI) Committee on Food Microbiology.

Throughout her career Jenny has shown dedication to her profession and has been honored with various awards including the 1987 Bill Williams Award for Scientific Excellence presented by Campbell Soup Company, Institute of Food Technologists Scientific Lecturer 1990-1992, and American Society for Microbiology Lecturer 1991-1992.

Jenny received her undergraduate degree in biology/psychology from Wellesley College. She received a master of science in bacteriology from the University of Wisconsin and a master of science in food science from the University of Maryland. She is currently working on her doctorate in food science at the University of Maryland.

UpDates

Claypool and Blakely Elected by A.D.P.I.

Dr. Larry L. Claypool, Mid America Dairymen, Inc., Springfield, MO., was elected President of the American Dairy Products Institute during the association's Annual Meeting held in Chicago. Claypool, a member of the ADPI Board of Directors since 1985, has served on the Institute's Executive Committee since 1987; he served as ADPI Vice President in 1995 and 1996. Claypool succeeds Donald L. Brick, Swiss Valley Farms Company, Davenport, IA.

Elected as Vice President was Dr. Lee E. Blakely, Dairyman's Cooperative Creamery Assn., Tulare, CA. Blakely was first elected a Director of the American Dairy Products Institute in 1989 and has been a member of the ADPI Executive Committee since 1990.

Other Officers elected to head the association were: Secretary, Mark Davis, Davisco Foods International, Inc., Le Sueur, MN and Treasurer, Walt Wosje, Michigan Milk Producers Assn., Novi, MI.

The American Dairy Products Institute was founded in 1986 by a merger of the American Dry Milk Institute and the Whey Products Institute. The Institute expanded the scope of its activities when the Evaporated Milk Association merged to become part of ADPI in 1987 and with the formation of a Cheese Division earlier this year. As the national trade association of the processed dairy products industry, ADPI represents firms associated with processed dairy products in all matters affecting the industry including government

liaison, market development and promotion, product standards, and consumer relations.

Thomas J. Miller, Jr. is New President of Zeiss Optical Systems, Inc.

Thomas J. Miller, Jr., has assumed the position of President of Zeiss Optical Systems, Inc., Thornwood, New York. The company is responsible for the sales and marketing of Zeiss laboratory and surgical microscope systems in the United States and Canada.

Mr. Miller joins the Zeiss organization after 15 years with Siemens Medical Systems. Most recently, he served as group Vice President for Imaging Systems at Siemens, based in Iselin, NJ. Prior to that position, Mr. Miller served for 3 years as General Manager of the Magnetic Resonance Division of Siemens responsible for the worldwide MR business, based in Erlangen, Germany.

Tom Miller earned a B.S. degree in Nuclear Engineering from the University of Massachusetts and participated in a special MIT/Harvard Medical School program in health sciences and technology, earning a S.M. degree in Medical Radiological Physics. He has lectured extensively on the diagnostic imaging industry and has served on many industry and governmental panels. He was chosen as one of "The 20 Most Influential People in Diagnostic Radiology" by Diagnostic Imaging magazine in December 1996.

Gary Williamson Joins Copesan Services as National Account Manager—Again

Gary Williamson has re-joined the National Accounts Division of Copesan Services as its Midwest National Account Manager. Gary became Copesan's first National Account Manager back in 1988, a position he held for six years. In 1994, Gary moved to Wil-Kil Pest Control, a Copesan operating company, to head up their commercial salesforce. As Copesan's "newest" National Account Manager, Gary will be responsible for overseeing the national account sales for Copesan in the Midwest region.

Gary brings a wealth of experience to the National Accounts team with nine years of pest control sales. Gary earned his bachelor's degree from the University of Wisconsin, Milwaukee.

Cooper Instrument Appoints New Sales Manager of Institutional Food Service Division

Cooper Instrument Corporation is pleased to announce the introduction of Robert Thomson as the new National Sales Manager of the institutional food service division. Thomson brings to Cooper over seven years of experience in the food service industry.

In his new capacity as National Sales Manager, Thomson will be

responsible for all phases of sales management, including directing sales representatives, setting sales objectives and goals, and maintaining and expanding national accounts in the food service and food processing markets.

Previously, Thomson served as District Manager for Carlisle, a manufacturer of plastic products. Prior to his position at Carlisle, Thomson spent six years with WorldCrisa, a distributor of table top products.

Thomson is a graduate of Quinnipiac College, Hamden, CT, where he received a bachelor's of science degree in Business Management with a Human Resources minor, and currently resides in Durham, CT.

Copesan Adds Ole Dosland as Technical & Training Director

Ole Dosland has recently been selected as Copesan's Technical and Training Director. This position has Ole performing specific duties such as: developing, implementing and monitoring technical training for Copesan's National Accounts and Operating Divisions; coordinating quality control for the Operating Division; assisting Copesan's National Accounts and Operating Division in the development of service specifications; providing technical information; and assisting in the development of service policies and procedures for Copesan's National Accounts and Operating Divisions.

Dosland comes to Copesan as an experienced and knowledgeable Sanitarian, with twenty-five years of tangible results in designing effective systems and an extensive record of accomplishments. Dosland's experience and achievements have come from many areas relating to the pest management industry.

Since 1991, Dosland acted as the Food Protection Specialist at ConAgra, Inc. in Omaha, NE. There, Ole implemented a regional sanitation program designed to meet Good Manufacturing and Food Safety Standards.

Dave Dixon Appointed Manager of Engineering

DCI Inc., manufacturers of stainless steel tanks for the worldwide food and dairy, pharmaceutical, beverage and chemical industries, announces the appointment of Dave Dixon as Manager of Engineering. He will be responsible for the design, drafting, and quality control groups.

Dave has been with DCI, Inc., since 1992 as a Design Engineer responsible for several major projects.

Dave was previously employed by Minnesota Valley Engineering designing cryogenic vessels in accordance with ASME, DOT and TUV codes.

Dave is a graduate in Mechanical Engineering from the University of Wisconsin, Madison. He is currently enrolled at St. Cloud State University, St. Cloud, MN, in their M.B.A. program.

Storhoff, Vaughn Honored by A.D.P.I.

The American Dairy Products Institute (ADPI), national trade association of the processed dairy products industry, announced the selection of Donald C. Storhoff and Robert E. Vaughn, as the recipients of its 1997 Award of Merit. The announcement was made during the Institute's 1997 Annual Meeting, April 20-22 at the Fairmont Hotel, Chicago, IL.

Storhoff, President of Foremost Farms USA, was cited for his depth of knowledge and vision of industry needs that led him into key roles in formulating national dairy policy with a focus on the development of international markets for dairy products during his 40-year span of industry service.

Vaughn, who has served the dairy industry for over 45 years, was recognized for his innovative leadership, depth of comprehension of the abilities, contributions and needs of colleagues and subordinates, and devotion to the advancement of industry progress.

The Award of Merit was established by the American Dairy Products Institute in 1991 to recognize individuals who have made outstanding contributions to the processed dairy products industry. Previous recipients of this award were M. E. "Mel" Franks in 1992; William F. Dietrich and Nico van Zwandedberg in 1993; Harvey H. Ebert in 1994; Wesley E. Eckert in 1995; and William A. Diehl in 1996.

Novel Strategies, Technologies to Control Microbial Threats are Keys to Enhancing Safety of U.S. Food Supply

IFT believes that efforts to enhance food safety should be guided by risk assessment and managed through the application of the Hazard Analysis and Critical Control Point (HACCP) system, which calls for food industries to implement science-based preventive measures of their own design. While HACCP can minimize or prevent food safety hazards, it cannot eliminate all hazards or guarantee food safety, in part because current science and technology are inadequate.

Microbial detection and identification methods are needed for verifying effectiveness of HACCP systems, as well as for identifying previously unidentified pathogens or those only suspected of being associated with foods.

As FDA considers implementing HACCP beyond the seafood industry, it is also suggested that, because resources are limited, the agency implement HACCP on the basis of significant safety risks associated with specific products and processes.

Other key research needs identified include: 1) development of objective microbial safety criteria, implemented on the basis of risk assessment, and 2) greater knowledge of the ecology of pathogens, including the recently identified pathogens *Escherichia coli* O157:H7 and *Cyclospora cayetanensis*; factors that affect their growth, inhibition and toxin production; and pathogens' ability to overcome their hosts' defenses and cause disease.

IFT believes that the creation of the interagency task force to carry out the President's National Food Safety Initiative raises the prospect that a new federal agency could be created to protect public



NEWS

health through food safety and security.

"A possible outcome of this initiative may be the creation of one agency to oversee surveillance, rapid response to outbreaks, research and education," Smith said. If such an agency were established, it could combine each of the food safety functions embodied in FDA and the U.S. Dept. of Agriculture, as well as the epidemiology and environmental aspects of food safety residing in the Centers for Disease Control and Prevention and the Environmental Protection Agency.

In addition, IFT strongly supports improvements in current foodborne disease surveillance systems and nationwide coordination of federal, state and local surveillance systems.

Mills and Dress Receive DFISA Distinguished Service Award

Vince Mills, Evergreen Packaging Co., and Carolyn Dress, Cahners Publishing Co. were selected by the International Association of Food Industry Suppliers, (DFISA) to receive Distinguished Service Awards at DFISA's April Annual Conference, in Scottsdale, AZ. The award

recognizes those who have demonstrated extra effort and given freely of their time on behalf of the association and the industry.

Mills began his service to DFISA 25 years ago by joining the association's Technical Committee; he has served the association as Chairman of the Technical Committee and Chairman of several Task Committees for the 3-A Sanitary Standards Program.

Dress has spent 13 years on DFISA Committees including the Marketing Committee, Annual Conference Committee and Expo Marketing Committee.

USDA Announces Suspension of California Strawberry Processor

The U.S. Department of Agriculture announced the suspension of a California fruit and vegetable processing company and its former President from contracting with the federal government, charging that it sold to USDA strawberries grown in Mexico for use in the National School Lunch Program. The federal government purchases only domestic produce for the School Lunch Program, and contractors are required to certify that their produce is grown domestically.

USDA is charging that Andrew and Williamson Sales Company, Inc., of San Diego, CA, (A&W) and its former President, Fred L. Williamson, falsely certified strawberries provided under contract for the School Lunch Program as "100 percent grown and packed in the United States." The strawberries, processed by A&W in 1996, were linked earlier this month to an outbreak of hepatitis A in Michigan. USDA's Food and Consumer Service issued an order to put on hold and keep from use more than 1 million pounds of the strawberries in 16 states and the District of Columbia. In an April 1 press release, A&W's parent company, Epitepe, Inc., indicated that "A&W inaccurately

described some of the strawberries associated with the outbreak as having been grown and processed in the U.S. as required..." USDA, the Food and Drug Administration, the Centers for Disease Control and Prevention, and the Department of Justice continue to investigate the incident and have not yet determined what charges may be brought against either Williamson or A&W. Acting Under Secretary for Food, Nutrition, and Consumer Services Mary Ann Keeffe said both A&W and its former President will be suspended until the investigation and any related legal actions are completed. "Selling foreign produce to the School Lunch Program under the pretense that it was grown in the U.S. is a very serious violation," Keeffe said. "A&W's parent firm has admitted to that violation. We are looking very closely at both A&W and Mr. Williamson to see what charges may be brought against them."

In a letter to both Williamson and A&W, Food and Consumer Service Administrator William E. Ludwig said the suspension "will be in effect pending further investigation of the alleged fraud and the completion of any related legal action." Ludwig said the suspension excludes A&W and Williamson from "engaging in most contracts and other transactions involving federal programs nationwide." Both are also barred from acting as a subcontractor under most government contracts.

New Clues on *Salmonella*

Several new studies cast fresh light on mysteries of *Salmonella* bacteria's infection of chickens. They also show that, to protect consumers, egg producers can test spleens of mice from the poultry house to see if they harbor a *Salmonella* type that infects chickens more readily. In one study, two years of sampling more than 1,000 mice from commercial poultry houses turned up *S. enteritidis* in the spleen of nearly one in

five. Scientists with USDA's Agricultural Research Service performed the studies with colleagues in the U.S., England and Australia. *Salmonella* contamination in eggs is rare, but *S. enteritidis* is the most common culprit. When consumed by a hen, the bacteria can multiply and invade organs including the reproductive tract. *S. enteritidis* varies in its ability to infect. But researchers now have identified two of its most serious forms. One, named the lacy phenotype, is hardier. Compared with ordinary *S. enteritidis* forms, the lacy phenotype infects chickens more readily, but it's not more likely to infect eggs or cause disease symptoms. But that's not the case with the other serious form, called the SE-HCD phenotype (short for *S. enteritidis*-high cell density).

Injecting chicks with typical *S. enteritidis* or the lacy phenotype rarely kills them. But in tests, the SE-HCD phenotype killed 70 percent in three days. Current tests indicate it also lowers egg production in adult hens. Until now, both the lacy phenotype and SE-HCD phenotype were difficult to study because they were indistinguishable from ordinary types. Also, the SE-HCD type loses its potent virulence in lab cultures. The researchers now have identified distinguishing features in carbohydrates called lipopolysaccharides on the surface of both phenotypes. They also developed the first lab-stable virulent strain.

The latest studies suggest a molecular approach to discovering environmental triggers that turn ordinary *S. enteritidis* into the more virulent type. This could lead to new tactics for lowering the *Salmonella* threat.

Collaborators with ARS in the studies included USDA's Food Safety and Inspection Service, the University of Pennsylvania, the University of Georgia, the University of New South Wales in Australia and, in Britain, the Public Health Laboratory Service and Centre for Applied Microbiology and Research.

FSIS Issues Directive on Advance Meat Recovery Systems

USDA's Food Safety and Inspection Service issued an advanced copy of Directive 7160.2 entitled "Meat' Prepared Using Advanced Mechanical Meat/Bone Separation Machinery and Meat Recovery Systems." This directive provides instructions to inspectors to determine whether product derived from the mechanical separation of skeletal muscle tissue from the bones of livestock is "meat." According to FSIS Constituent Update, FSIS issued the Directive to clarify that inspection program personnel should take all bone-related components into account when evaluating product derived from the mechanical separation of skeletal muscle tissue from the bones of livestock. The Directive specifically instructs personnel, when assigned by PBIS to perform Inspection System Guide task 06D06b2, to also "determine whether the establishment is completely removing spinal cord from the neck and/or back bones (if any) before bones enter the system."

Further, if it is believed that establishment personnel are not doing so, inspectors are instructed to "take a 1/4 pound sample of the finished product and send it to FSIS' Eastern Laboratory."

ACIL Launches Web Site; Offers Links to Independent Testing Firms

ACIL, the national trade association representing independent scientific and engineering laboratory, testing and research firms, has joined the Internet, with a home page on the World Wide Web. The ACIL Home Page can be accessed at <http://www.acil.org>.

The ACIL Home Page features links to ACIL member web sites.

ACIL members provide a wide range of analytical, testing, inspection and R & D services to clients in the public and private sectors. Links to government and business sites of interest to the scientific and engineering community are also offered on the site.

Time Extended for Relabeling of CTC/OTC Feeds

In a January 30, 1997 CVM Update, the Center for Veterinary Medicine announced that the approved conditions of use for some Type A medicated articles containing chlortetracycline (CTC) and oxytetracycline (OTC) were changed as a result of the approval of several supplemental new animal drug applications (NADAs) in accordance with findings of the National Academy of Sciences/National Research Council (NAS/NRC), Drug Efficacy Study Group's (DESI) effectiveness evaluations and the approval of "me-too" NADAs that were dependent upon the DESI-finalization. These changes in labeling no longer allow CTC or OTC in the rations of lactating dairy cows.

In that CVM Update, the Agency stated that manufacturers of these Type A articles would have until April 1, 1997, to revise labeling to comply with the new conditions of use and to cease marketing any of these products bearing unrevised labeling. Similarly, mills manufacturing feed incorporating these Type A articles would have until April 1, 1997, to use up existing stocks of labeling, and to print and begin using revised labeling.

CVM is now extending the time for relabeling of feeds made from CTC and OTC to provide for an

orderly transition in the marketplace. CVM is not changing the date the Type A medicated article manufacturer/sponsor needs to have its labeling changed. That date remains April 1, 1997.

CVM is granting an extension of time for distributors in the drug and feed industry to allow for depletion of existing stocks of the previously labeled product. They will have until October 1, 1997, to cease distribution of the old Type A product, and to begin distributing the revised labeled Type A product. After that date, distributors may not sell Type A medicated articles that are not labeled in compliance with the DESI changes.

CVM is granting an extension of time to the feed manufacturers using these Type A products to allow for development and printing of new labels and depletion of existing labeling for products made from the Type A articles. They will have until April 1, 1998, to make this change. After this date, feed manufacturers may not use Type A medicated articles that are not labeled in compliance with the DESI changes and they may not distribute feeds that are not labeled in conformance with the DESI changes.

Salmonella Linked to Cheese Makers

Health officials are cited as saying that two home-based cheese-making operations have been shut down after more than 100 people were sickened by *Salmonella*, since mid-Feb. and investigations revealed that all eaten queso fresco or cotija cheese made at homes in Gilroy and San Jose.

Trevor Hayes of the Santa Clara County Department of Environmen-

tal Health was cited as saying that at both unlicensed locations, cheese was made with unpasteurized milk in unsanitary conditions. Criminal charges remain a possibility.

Osmonics Acquires AquaMatic, Inc.

Osmonics, Inc. announced the completion of its acquisition of AquaMatic, Inc. of Rockford, IL. Terms of the acquisition were not disclosed. AquaMatic is a supplier for the water treatment equipment market.

AquaMatic, an important supplier to the water purification industry for more than 60 years, pioneered automatic water softener controls in 1931. AquaMatic generated sales of nearly \$13 million for the year ended December 31, 1996, and will be additive to Osmonics earnings.

AquaMatic will continue to operate out of Rockford, and will be closely aligned with Osmonics' Milwaukee business unit.

Silver Medal of Merit Awarded

On the 19th, March 1997 the President of the Governing Council of the University of Utrecht presented to Professor D. A. A. Mossel, BM, MA, Ph.D., MD., DVM (Hon.), FAPHA, FIFST, the Silver Medal of Merit of the University. This honour was bestowed because of excellent functioning for 12 1/2 years as the Eijkman Professor-Emeritus of Medical Food and Water Microbiology.

During the same solemn event, Professor Corry B. Struijk, BSc, MA, Dip. Med. Biol. Arch., was officially confirmed as the Incoming President of the Eijkman Foundation.

At the Board of Trustees' request Professor Mossel accepted to continue functioning as the Board Member in Charge of Postgraduate Education offered by the Eijkman Foundation in the E.U., the U.S. and under the auspices of U.N.-Agencies.

DFISA Adopts New Name

The International Association of Food Industry Suppliers — that's the new organizational name adopted recently by the Dairy & Food Industries Supply Association.

DFISA members approved the new name during the group's annual meeting in Scottsdale, AZ. The change was recommended by a special Strategic Planning Committee, which also used the occasion of the annual meeting to publish the results of a year-long "industry future" study.

This is the sixth name the Association has had. The most recent change occurred in 1963, when DFISA replaced the previous "Dairy Industry Supply Association." This name change is intended to express more accurately the Association's mission in light of four key change factors shaping the industry today, said DFISA President John M. Martin.

"The food supply industry is becoming a global business," Martin explained, "and our members have both fewer and larger customers. Moreover, our markets are growing in complexity, with many firms doing business at multiple levels in the food supply and production channel. Finally, we see new markets emerging, particularly overseas."

The Strategic Planning Committee was chaired by Steve Lefevre of King Engineering Corporation, who stressed the Association's most fundamental goals are to help members compete in the future and to

find new customers in the U.S. and around the world. The future study, published as a 180-page book entitled *The Food Industry Today*, predicted that markets overseas will grow more quickly than domestic markets, and that multinational firms now dominate the food processing industry.

After presenting the recommendations of the Strategic Planning Committee, DFISA Chairman John R. Sherrill, Jr., of M.G. Newell Corp., conducted a unanimous voice vote to approve the new name.

Calcium from Dairy Foods May Reduce Kidney Stone Risk in Women

In the ongoing debate on the value of dairy products vs. calcium supplements as a source of minerals, there is good news for dairy. A new study suggests that women who rely on low fat milk and other dairy foods for their calcium may be at lower risk of developing kidney stones. The study published in the *Annals of Internal Medicine* found that a high intake of milk and milk products, the major source of dietary calcium, significantly decreased the risk for kidney stones among women with no prior history of stones. No reduction in risk was observed in those relying on calcium supplements.

In the past, patients at risk for kidney stones were often advised to limit their intake of calcium. In recent years, however, research has indicated that low-calcium intake may increase the risk of kidney stones in healthy individuals. A low-calcium diet also increases the risk for osteoporosis, particularly among women.

Fredric L. Coe, M.D., from the University of Chicago Medical School, wrote an accompanying editorial urging physicians to drop dietary calcium restriction from

their list of preventive and therapeutic measures for patients at risk for kidney stones.

To meet current calcium requirements (1,000 milligrams/day as set by the National Institutes of Health), at least three servings of milk or milk products are recommended daily. According to the most recent government statistics, nearly 9 out of 10 women fail to meet these calcium recommendations. But even with this shortfall, experts point to the nutritional advantages of closing the calcium gap with food instead of pills.

While the new study did not determine the reason for the reported reduction in the risk of kidney stones observed, the researchers suggest that it may be linked to a reduction in the absorption of oxalate (calcium oxalate stones are the most common) that occurs when calcium is consumed as part of a food, hypothesizing that calcium consumed without food may not have the same effect.

This is the second study in recent months pointing to the benefits of milk and milk products vs. calcium supplements. A study published in the October issue of the *American Journal of Clinical Nutrition* found that women who relied on skim milk as their calcium source significantly improved not only their intake of calcium, but of the many other nutrients including protein, phosphorus, potassium, magnesium, riboflavin, thiamin and zinc. In contrast, women who relied on calcium supplements increased only their intakes of calcium and sodium.

The most recent study concerning the risk of developing kidney stones, conducted at Brigham and Women's Hospital, Harvard Medical School, Harvard School of Public Health and Massachusetts General Hospital, analyzed the diets of more than 91,000 women participating in the Nurses' Health Study. The women were aged 34 to 59 years of age with no prior history of kidney stones.

IndustryProducts



Measurement Dynamics

HACCP Warrior PTR™

Measurement Dynamics continues its tradition of product innovation with the addition of the HACCP Warrior PTR™ to its Warrior group of products. The HACCP Warrior PTR™ is a multi-channel unit that can receive data directly from up to 200 locations within a processing plant, or cold storage warehouse. With its open software architecture the unit can be set up to monitor and record many different functions. It makes documenting CCP'S easy and affordable.

With the ability to custom design application specific temperature probes or to receive data from sensors of varying suppliers the HACCP Warrior PTR™ can meet even the most stringent demands. With a 485 computer buss interface to utilize probe inputs you can daisy chain modules together to simplify wiring. With the available FM pulping probe the collection of on-the-spot data has a permanent place to be collected instead of

being on clipboards and pieces of paper everywhere. HACCP Warrior PTR™ the total compliance system to meet your needs now and in the future.

Measurement Dynamics, West Warwick, RI

Reader Service No. 376

Whatman LabSales Long Stem Thermometer

Whatman LabSales recently added to its product line a unique Long Stem Thermometer perfect for measurements in deep or tall containers used in food testing and analysis or any general laboratory. The Long Stem Thermometer features an 8" stainless steel probe that is resistant to acids, solvents and most chemicals. The readout is an easy-to-read digital display. This handy thermometer is C/F switchable with a temperature range of -58° to 302°F, -5° to 150°C.

Whatman LabSales Inc., Hillsboro, OR

Reader Service No. 377

Labconco's RapidVap® Evaporation System Uses Three Processes to Speed Evaporation

Labconco Corporation, Kansas City, Missouri, offers the RapidVap® Evaporation System, an instrument capable of processing multiple biological or analytical samples with individual volumes

up to 450 milliliters. Vortex action, heat and vacuum combine to achieve fast evaporation rates. Methylene chloride evaporates at a rate up to 5 ml/min/tube and water evaporates at a rate up to 1 ml/min/tube.

A microprocessor-controlled, mechanically-created vortex action forces the liquid sample outward against the tube walls increasing the surface area for faster evaporation. The vortex action also helps mix the sample and contain the analytes in the solvent for maximum sample recovery.

A block heater supplies a precisely controlled amount of dry heat from ambient to 90°C to the samples to speed evaporation. Unlike water bath heaters, the block heater requires little maintenance. A built-in vacuum controller allows the user to adjust vacuum levels. A gauge displays the system vacuum in inches of mercury and mBars.

Other features include a control panel with switches for programming time, heat and vortex speed, an LED display that prompts the user to set program parameters and digitally shows actual running conditions, a retractable drain hose for emptying any spills that occur inside the chamber, and a safety lid switch that prevents motor start-up if the lid is open and interrupts power to the motor if the lid is raised.

Labconco Corporation, Kansas City, MO

Reader Service No. 378

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3M Introduces New Time and Temperature Indicators for Product Monitoring During Shipment and Storage

3M is announcing the addition of three new time and temperature indicators designed to clearly and accurately monitor exposure of products to excessively high temperatures during shipping and storage. The new 3M™ MonitorMark™ Time and Temperature Indicators monitor products with 26°C (79°F) storage temperature thresholds and are ideal for monitoring foods with high oil content, paint, sealing tapes, and medical and pharmaceutical products.

MonitorMark™ time/temperature indicators feature a high-contrast indicator that turns blue as a result of exposure to rising temperatures. The indicator is irreversible, even after temperatures return to acceptable levels. Placed directly on secondary shipper boxes of temperature-sensitive products during shipment and storage, the indicators provide an accurate measure of time and temperature exposure and can be tailored to meet specific product storage needs.

The new indicators were added to the MonitorMark indicator product line in response to requests from the food, medical and adhesive industries where proper shipment and storage is vital to product freshness and efficacy.

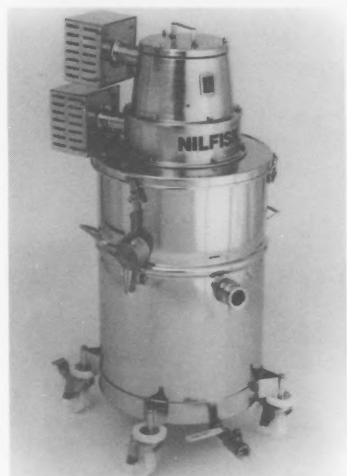
Identified by the product numbers – 26I, 26L and 26N – the new 3M time/temperature indicators monitor products during shipping and storage periods of two days, one week or two weeks, respectively.

The MonitorMark indicator product line features products – including custom indicators – which monitor products for as little as 30 minutes to as many as two

weeks. The product line also includes indicators which monitor temperatures ranging from -17°C (2°F) to 42°C (108°F).

3M Monitoring Systems,
Minneapolis, MN

Reader Service No. 379



Nilfisk of America

Nilfisk of America CWR75SS Ideal for Food Processing Cleanrooms

Cleanrooms, or controlled environments, are a relatively new concept to the food processing industry. However, several factors, including broader-based FDA/USDA regulations and a demand for longer shelf-life, may soon make cleanrooms more common in food processing. The use of a cleanroom with a HEPA*-filtered vacuum cleaner can help prevent the number one food safety hazard, microbial foodborne disease, and drastically reduce the risk of cross contamination between ready-to-eat foods and raw materials.

The Nilfisk CWR75SS wet/dry vacuum cleaner is ideal for use in the food processing industry because its multi-stage filtration system meets cleanroom standards. The vacuum cleaner's electro-

polished 316L grade stainless steel tank, components and trolley make the unit autoclave safe. In addition, this machine features food grade welds that retard microbial growth and allow for easy decontamination.

The CWR75SS features a graduated filtration system. The first stage of filtration is a foam impact filter, which fits over and protects the float valve from clogging debris. The main filter consists of 105 porous, polyethylene tubes which are water, mildew, rot and corrosion resistant. With its labyrinthine design, this filter can capture particles down to one micron. It is covered by an exclusive splash guard to protect against excessive moisture and further extend the life of the filter. The final step in motor prefiltration features a microfilter, which protects the optional internal "backup" HEPA or ULPA** filter and acts as a barrier to even bacteria-sized particles. In addition, vacuums may be equipped with HEPA or ULPA filters on both the working and cooling airflows.

Material can be collected in one of two-container options: a 12-gallon disposable paper bag for dry collection only or direct collection into the 19-gallon vacuum tank. The vacuum has an optional drain valve which ensures easy disposal of liquid debris.

Nilfisk of America, Inc.,
Malvern, PA

Reader Service No. 380

Save Time and Eliminate Chemical Waste with Gelman Sciences Ion Exchange Membrane Filters

Gelman Sciences offers ICE-450® and SB-6407—true microporous membranes with controlled ion exchange capacities and excellent mechanical wet strength. These membranes are especially

suitable for trace metal analysis of power plant cooling water and boiler feed water.

ICE-450 and SB-6407 Ion Exchange membranes are priced significantly lower than competitive filters. To use these filters, simply place the filter in a holder, filter the sample, digest and analyze. There is no need to precondition the filter before filtering or desorb the captured ions before analyzing. This saves the user time and eliminates chemical waste. Filters are easily digestible, making sample prep and analysis easier, while creating less waste.

ICE-450 is a strongly acidic cationic microporous membrane filter. Ion exchange capacity is provided by a patented sulfonation process. Filters are supplied in the hydrogen ion form of the sulfonic acid (functionality) active sites.

SB-6407 is a strongly basic anion exchange membrane filter. Ion exchange capacity is provided by a patented chemistry which utilizes quaternary ammonium active sites. Filters are supplied in the chloride ion form.

Gelman Sciences, Ann Arbor, MI

Reader Service No. 381

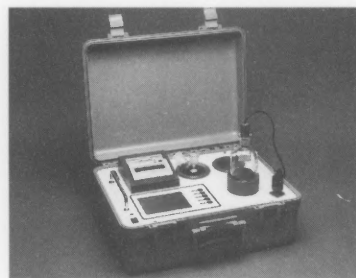
Idexx Introduces 48-H SimPlate™ Test for Yeast and Mold

IDEXX Laboratories, Inc. introduces a new test for detecting and quantifying the concentration of yeasts and molds in beverages and foods. The new test, SimPlate Yeast and Mold, delivers total yeast and mold counts in just 48 hours compared to 5 days with traditional methods. Faster results speed up the quality control process and allow product to move more quickly through processing and into distribution. And since SimPlate is easy to use and read, technicians can increase testing volume without sacrificing accuracy.

SimPlate for Yeast and Mold, an enzyme-based test, is performed by mixing dehydrated medium powder with sterile water, adding the medium and the sample to a disposable SimPlate device, and incubating it for 48 hours at 30°C. No membrane filters, filtration units, clamping devices, enzyme digestors, pH adjustments, or antibiotics are needed. After incubation, wells containing yeasts or molds produce a blue fluorescence and are easy to count without a colony counter, so results are consistent between technicians and across multiple plants. The test can also be incubated at 25°C for 72 hours, which gives flexibility in managing the weekend schedule.

IDEXX Laboratories, Inc.,
Westbrook, ME

Reader Service No. 382



Bioscience, Inc.

New Portable Activity/Toxicity Meter

A new portable BOD meter from Bioscience, Inc. can also be programmed to evaluate biomass activity and the toxicity of a specific waste stream in as little as 15 min.

The 15 min. specific oxygen uptake rate (SOUR) reports milligrams of oxygen consumed per hour per gram of biomass. It can be used to evaluate the activity of an activated sludge mixed liquor or the stability of digested waste activated sludge.

A second pre-programmed test takes up to two hours and evaluates

the immediate and recovery oxygen uptake associated with the introduction of an influent stream or compound to a biomass. Oxygen uptake data is collected for 1 to 2 hours, and results are reported in milligrams of oxygen per liter to determine the toxicity, treatability or inhibitory characteristics of the influent stream or compound. Unlike other "toxicity" monitors which use marine microbes or bioluminescence, the EZ-BOD® Meter uses the actual microbes from the treatment system to determine toxicity. The results are directly correlatable to treatment plant response.

Both tests can be performed by placing a sample of microbial biomass (activated sludge) in the test bottle with the wastewater to be analyzed. An integrated, self-calibrating DO probe is then inserted and instructions for conducting the selected test appear on a liquid crystal display. The meter monitors DO as the test proceeds, automatically graphs and stores the data, calculates the test results and prints out a report.

The EZ-BOD Meter is preprogrammed to perform SOUR tests (U.S. 503 Sludge Regulations); one-hour biotreatability evaluations (ASTM-Method 4478); ST-BOD BOD₅ estimation tests; and dissolved oxygen measurements. The size of a large briefcase, it can be used in the field with rechargeable batteries or as a benchtop instrument.

Bioscience, Inc., Bethlehem, PA

Reader Service No. 383

Faucet Control Reduces Risk of Cross-Contamination

Restaurant owners and other foodservice professionals can control the spread of bacteria and reduce operating costs by using the

Quik Flo®, an Automatic Faucet Control® (AFC) manufactured by International Environmental Solutions, Inc. of Clearwater, FL.

Quik Flo allows food handlers to wash their hands while avoiding contact with sink faucet handles. Since food particles on the handles spread bacteria and germs, health departments in some cities have started requiring restaurant personnel to avoid touching faucet handles. Restaurant owners are finding that installing Quik Flo provides an inexpensive solution to the cross-contamination problem. It also significantly reduces water consumption.

The threaded, solid brass and chrome-plated AFC valve can fit any faucet and installs quickly by simply unscrewing the existing aerator and replacing it with Quik Flo. A durable stainless steel rod acts as a drip-free, automatic on/off control that can be moved in any direction by moving it with an arm or back of the hand. The rod comes in two sizes for standard (3") or gooseneck (6") faucets. The water flow and temperature are preset by adjusting the faucet handles.

In testing performed by American Standard's U.S. Plumbing Products Group, each model was found to "...operate normally after a life test of 500,000 cycles at 120 psi." More than 200,000 Quik Flo and other AFC valve models are in use by professionals and consumers in the United States and 16 foreign countries.

The easy-to-disinfect Quik Flo valve costs a fraction of infrared faucets with a suggested list price of \$19.95. The Quik Flo is covered by an unconditional two-year warranty. Theft-proof and vandal-proof models also available.

International Environmental Solutions, Inc., St. Petersburg, FL

Reader Service No. 384



Tekmar-Dohrmann

Powerful Magnetic Stirrer & Hot Plate

Tekmar now offers the newly updated line of magnetic stirrer and hot plates. The new RCT and RET Basic, the RET Digi-Visc and RET Control-Visc display innovative features. All models incorporate a special design that isolates the electronics, protecting them from corrosive vapors. With powerful stirring, speed control, digital display, high wattage and computer interface, quality and reliability is built into every unit.

Tekmar-Dohrmann, Cincinnati, OH

Reader Service No. 385

New Products in North America for Microbial Analysis of Food and Environmental Samples

The full range of products for the microbial analysis of food and environmental samples for Microgen Bioproducts Ltd. (Surrey, U.K.) is now available in North America through Kalyx Biosciences Inc.

Microbact™ Bacterial Identification Systems for *Listeria*, Gram Negative *Bacilli*, and *Anaerobes* are simple and reliable test systems based on established biochemical tests. The convenient microwell format enables accurate species identification without the need for specialized reagents, training, or equipment. The Microbact™ 12L *Listeria* Identification System produces clear and reproducible

results when confirming positive *Listeria* spp. samples, and includes a micro-haemolysis test as part of its microwell format. The Microgen Rapid Culture Confirmation Assays are latex culture confirmation tests designed to provide easy one-step identification of *Listeria* spp., *Salmonella* spp., *E. coli* O157, *Campylobacter*, and *Staphylococcus aureus*.

Microgen products are available in a variety of sizes and formats to accommodate all laboratory work flows.

Kalyx Biosciences Inc., Nepean, Ontario, Canada

Reader Service No. 386

Prism's Gold Medal Program is ISO 9002 Registered Pest Elimination Service

Quality assurance in pest management services no longer means "take our word for it." Prism's Gold Medal™ Program is ISO 9002 Registered, with independent auditors verifying that the program meets tough, world-class quality assurance system standards. The first Integrated Pest Management (IPM) program with ISO 9002 Registration to be offered in North America, Gold Medal was developed for the food processing industry. It is available from Prism Integrated Sanitation Services in the U.S. and PCO Services, Inc. in Canada.

Gold Medal is a true IPM program. It is based on the six critical IPM steps – monitoring, pest identification, sanitation, exclusion, extermination and verification. As a result, Gold Medal customers enjoy a customized program, 24-h technical support, full documentation, 100 percent satisfaction guaranteed and peace of mind.

Prism, Miami, FL

Reader Service No. 387

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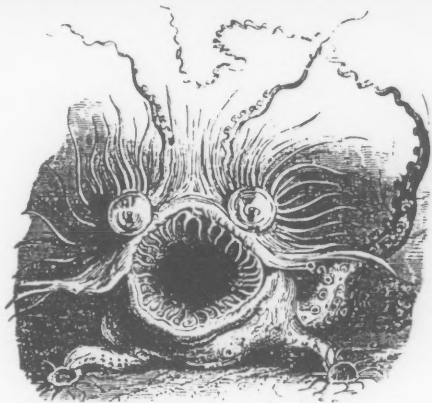
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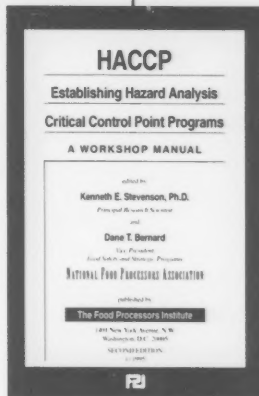
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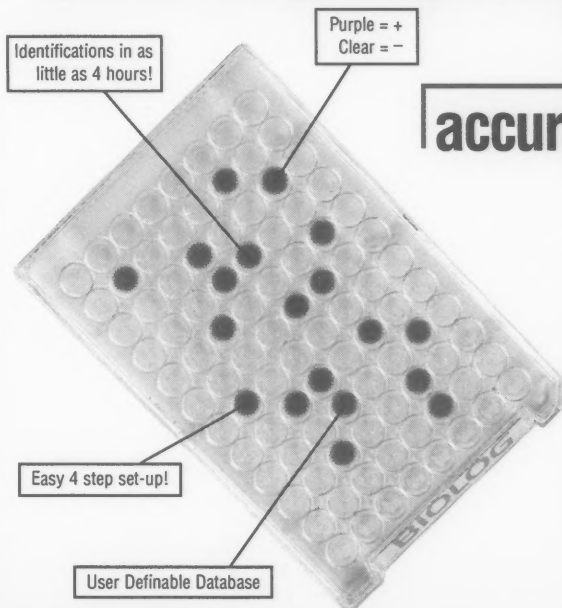
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Announcing the 1997 Award Winners

The Awards Presentation will be July 9, 1997 at the 84th IAMFES Annual Meeting

C. B. Shogren Award –

Awarded to: Florida Association of Milk,
Food & Environmental Sanitarians

Norbert F. Sherman Award – Sponsored by:
*The Educational Foundation of the National
Restaurant Association, Chicago, IL*

Awarded to: Kermit M. McKemie – “First
Things First: Supermarket Inspection Priorities”

Samuel J. Crumbine Award –

Awarded to: Madison Department of Public
Health, Madison, WI

Sanitarian Award – Sponsored by Ecolab,
Food and Beverage Division, St. Paul, MN

Awarded to: Randall Daggs

Educator Award – Sponsored by IBA,
Millbury, MA

Awarded to: Purnendu C. Vasavada, Ph.D.

Harold Barnum Industry Award – Spon-
sored by NASCO International, Fort Atkinson, WI

Awarded to: John G. Cerveny

Harry Haverland Citation Award – Spon-
sored by DiverseyLever, Plymouth, MI

Awarded to: Earl O. Wright

Honorary Life Award –

Awarded to: Frank L. Bryan, Ph.D.

Black Pearl Award – Sponsored by Wilbur
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Springfield, MO

Awarded to: Pappetti's of Iowa, Lenox, IA

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Coming Events

JULY

• **6-9, IAMFES Annual Meeting**, in Orlando, FL at the Hyatt Regency Grand Cypress Hotel. Advancing food protection worldwide with over 200 presentations and posters on the latest issues and research on food safety. For complete program and registration information, call (800) 369-6337; (515) 276-3344; Fax: (515) 276-8655; E-mail: iamfes@iamfes.org.

• **21-23, Current Good Manufacturing Practice (cGMP) for the Pharmaceutical and Allied Industries**, Cincinnati, OH. Topics covered will include not only the legal requirements for cGMP in the Federal Food, Drug, and Cosmetic Act but primarily the practical "how to" of purchasing, manufacturing, packaging, labeling and QA/QC, as well as training production personnel in cGMP. For more information, contact Registrar, The Center for Professional Advancement, P.O. Box 1052, East Brunswick, NJ 08816; Phone: (908) 613-4500; Fax: (908) 238-9113.

• **24-25, Food Safety Technology '97 Seminar**, U.S. Trade Center, Tokyo, Japan. This event is being coordinated with the ongoing efforts of the U.S. Dept. of Agriculture, Foreign Agricultural Service to encourage the adoption of HACCP standards by Japanese food processing industries. For further information, contact **via international courier*; Ms. Yoko Hatano, Commercial Service, U.S. Embassy, 1-10-5 Akasaka Minatoku, Tokyo 107 Japan, Phone: 81-3-3224-5318; Fax: 81-3-3589-4235; **via U.S. postal service*; Mr. Keith Kirkham, Commercial Attache, U.S. Embassy, Unit 45004, Box 204, APO AP 96337-5004; Phone: 81-3-3224-5085; Fax: 81-3-3589-4235.

AUGUST

• **11-15, Intro. to Food Science: Principles and Recent Advances**, Brunswick, NJ. The best food technologists need a broad understanding of food science that includes food microbiology, color and flavor chemistry, protein biochemistry, sensory evaluation and nutrition. This five-day program will give you a solid background in the science and applications of emerging technologies in the food industry. For additional information, contact Keith Wilson at (908) 932-9271 ext. 617 or Fax: (908) 932-1187.

SEPTEMBER

• **7-9, Quality Through Diversity Conference**, Renaissance Airport Hotel in Orlando, FL. The American Hotel and Motel Association and Conrad N. Hilton College at the University of Houston are joining together in announcing the 1997 Hospitality Industry Quality Through Diversity Conference. For more information, contact Laura Sutherland at (713) 743-2446.

• **8-10, Artisan Bread Decorating Techniques**, Manhattan, KS. This course will teach bread decorating techniques to create display loaves for use in bread displays. For additional information, or to enroll, contact American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502 or Phone: (913) 537-4750; Fax: (913) 537-1493.

• **8-10, Cell Culture and Hybridomas: Quality Control and Cyopreservation Techniques Workshop**, sponsored by the American Type Culture Collection (ATCC). For more information, contact ATCC, Workshop Coordinator, 12301 Parklawn Dr., Rockville, MD 20852;

Phone: (800) 359-7370; Fax: (301) 816-4364; E-mail: workshops@atcc.org.

• **11-12, HACCP 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 for your facility. 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; or Phone: (913) 537-4750; Fax: (913) 537-1493.

• **17-18, Washington Milk and Food Sanitarians Association's 1997 Annual Meeting**, in Wenatchee, WA at the Wenatchee Red Lion Inn. Inquiries can be sent to Dr. Lloyd Lueddecke, Dept. of Food Science & Tech., Washington State University, Pullman, WA 99164-6376.

OCTOBER

• **5-9, Saudi Agriculture 97, 16th Agriculture, Water and Agri-Industry Show**, at the Riyadh Exhibition Centre. Further information can be obtained from Virginia Jensen, Kallman Associates, 20 Harrison Ave., Waldwick, NJ 07463.

• **8-10, Quality Management in the Food Industry**, Statler Hotel, Cornell University, Ithaca, NY. This 3-day introductory course is co-sponsored by the IFT Continuing Education Committee, IFT Food Quality Assurance Division, and Cornell University. For further information, contact Institute of Food Technologist's Professional Development Department at (312) 782-8424.

• **12-16, American Association of Cereal Chemists 82nd Annual Meeting**, at the San Diego Convention Center, San Diego, CA. The An-

nual Meeting includes a technical program, technical and poster sessions, table-top exhibits, new product/services sessions, educational short courses and social events. For additional information, contact AACC Headquarters, 3340 Pilot Knob Road, St. Paul, MN 55121-2097, or Phone: (612) 454-7250; Fax: (612) 454-0766.

• **13-16, ASI Fall Workshop, HACCP Workshop for Food Processors**, in Atlanta, GA. For information, contact Vicki Bodrow, ASI Food Safety Consultants, Inc. 7625 Page Blvd., St. Louis, MO 63133; Phone (800) 477-0778.

• **13-16, Environmental Seminar Series for Asian Processors**, in Las Vegas, NV. For more information, contact Sacha Helfand at (703) 684-1080; E-mail: fpmsa@clark.net.

• **20-23, Packaging Basics for the Food Industry, School of Packaging**, Michigan State University, E. Lansing, MI. This 3-day introductory course is co-sponsored by the IFT Continuing Education Committee, IFT Food Quality Assurance Division, and Cornell University. For further information, contact Institute of Food Technologists Professional Development Department at (312) 782-8424.

• **22-24, Food Microbiology Symposium and Workshop**, The University of Wisconsin - River Falls, River Falls, WI. The symposium title is "Current Concepts in Foodborne Pathogens and Rapid and Automated Methods in Food Microbiology." A Rapids Methods in Food Microbiol-

ogy workshop designed to provide practical demonstrations and discussion of various tests and instruments available for rapid detection, isolation and characterization of foodborne pathogens and toxins as well as prediction of shelf life and checking hygiene and sanitation in food processing facilities is also scheduled. For additional information, contact Dr. Purnendu C. Vasavada, Animal and Food Science Dept., University of Wisconsin - River Falls, River Falls, WI 54022 or Phone: (715) 425-3150; Fax: (715) 425-3785; E-mail: purnenduc.vasavada@uwrf.edu.

• **27-30, Freezing and Freeze-Drying of Microorganisms Workshop**, sponsored by the American Type Culture Collection (ATCC). For more information, contact ATCC, Workshop Coordinator, 12301 Parklawn Dr., Rockville, MD 20852; Phone: (800) 359-7370; Fax: (301) 816-4364; E-mail: workshops@atcc.org.

• **29-2, Nov., Worldwide Food Expo 97**, Chicago, IL. The Dairy and Food Industries Supply Association (DFISA), the International Dairy Foods Association (IDFA), and the National Food Processors Association (NFPA) will cosponsor Worldwide Food Expo 97 in Chicago's McCormick Place. To have Worldwide Food Expo 97 information faxed to you, call (503) 402-1352.

• **30-2 Nov., American Meat Institute's (AMI) 1997 International Meat Industry Convention and Exposition**, held in Chicago, IL at McCormick Place. For more infor-

mation, contact AMI's Convention Management Group at (703) 876-0900.

NOVEMBER

• **3-4, International Dairy Federation Holds Symposium on Standards and Trade**, at the Palmer House Hilton Hotel in Chicago, IL. The symposium will examine the role of Codex Alimentarius, its relationship with the World Trade Organization (WTO) and its impact on dairy product standards - both national and international. For further information, contact Anne Divjak at the International Dairy Foods Association, 1250 H Street N.W., Suite 900, Washington, D.C. 20005; Phone (202) 737-4332; Fax: (202) 331-7820; E-mail: adivjak@idfa.org.

• **17-20, ASI Fall Workshop, Food Safety and Sanitation**, in Chicago, IL. For information, contact Vicki Bodrow, ASI Food Safety Consultants, 7625 Page Blvd., St. Louis, MO 63133; Phone (800) 477-0778.

DECEMBER

• **3-5, 3rd Annual SERDP Symposium**, at the Washington Hilton Hotel, Washington, D.C. For the first time, it will be sponsored in cooperation with the Environmental Security Technology Certification Program (ESTCP). For further information, contact SERDP Program Office, 901 N. Stuart St., Suite 303, Arlington, VA 22203; Phone (703) 696-2117; fax (703) 696-2114.



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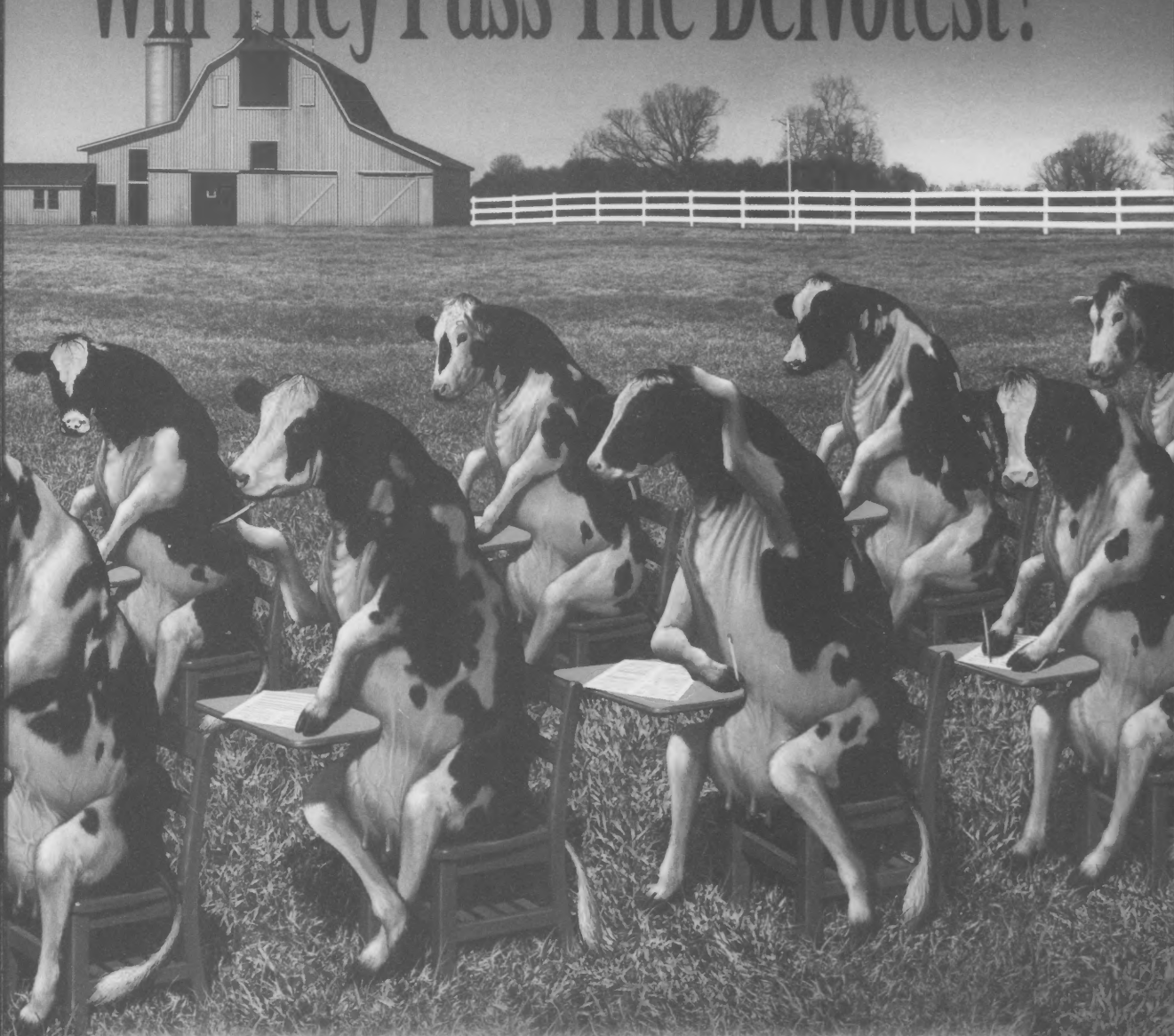
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