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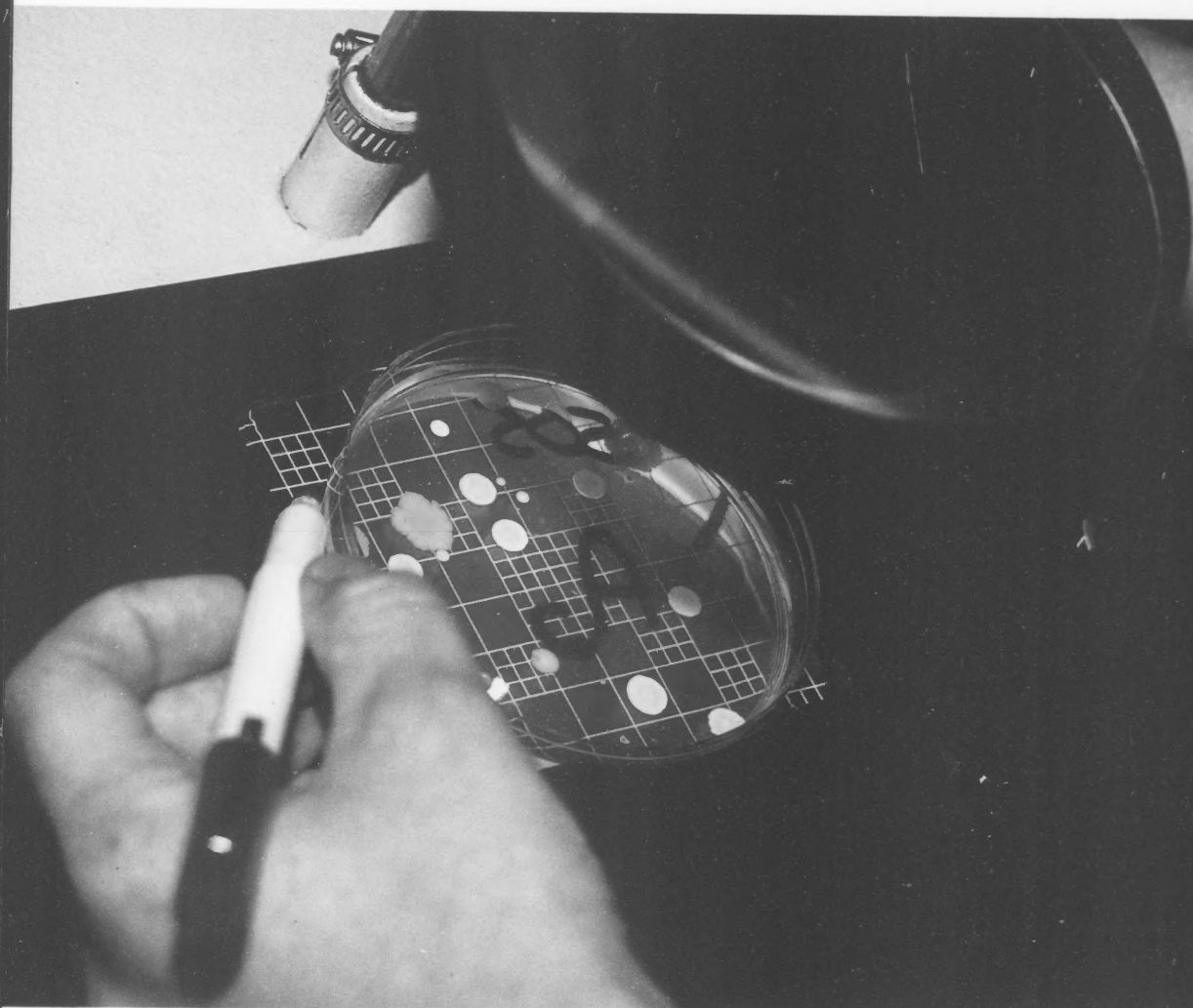
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DAIRY, FOOD AND ENVIRONMENTAL

# SANITATION

SEPTEMBER 1994



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

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



# This is Your Personal Invitation to Join

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

## **Who are IAMFES Members?**

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The Association is comprised of a diverse membership of over 3,500 from 38 nations. IAMFES members belong to all facets of the food protection arena. The main groups of Association members fall into three categories: Industry Personnel, Government Officials and Academia.

## **Why are They IAMFES Members?**

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

## **Your Benefits as an IAMFES Member**

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

*Journal of Food Protection* — A refereed monthly publication of scientific research and authoritative review articles. Each issue contains 12 to 15 technical research manuscripts and one to five articles reporting a wide variety of microbiological research pertaining to food safety and quality. The *Journal of Food Protection* is internationally recognized as one of the leading publications in the food and dairy microbiology fields. This journal is available to all individuals with the Member *Plus* option.

**The IAMFES Annual Meeting** — Held in a different city each year, the IAMFES Annual Meeting is a unique educational event. Three days of technical sessions, scientific symposia and commercial exhibits provide members and other industry personnel with over 100 presentations on the most current topics in food protection. It offers the opportunity to discuss new technologies and innovations with leading authorities in various fields concerned with food safety. IAMFES members receive a substantially reduced registration fee.

## **To Find Out More...**

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To learn more about IAMFES and the many other benefits and opportunities available to you as a member, please call (515) 276-3344.

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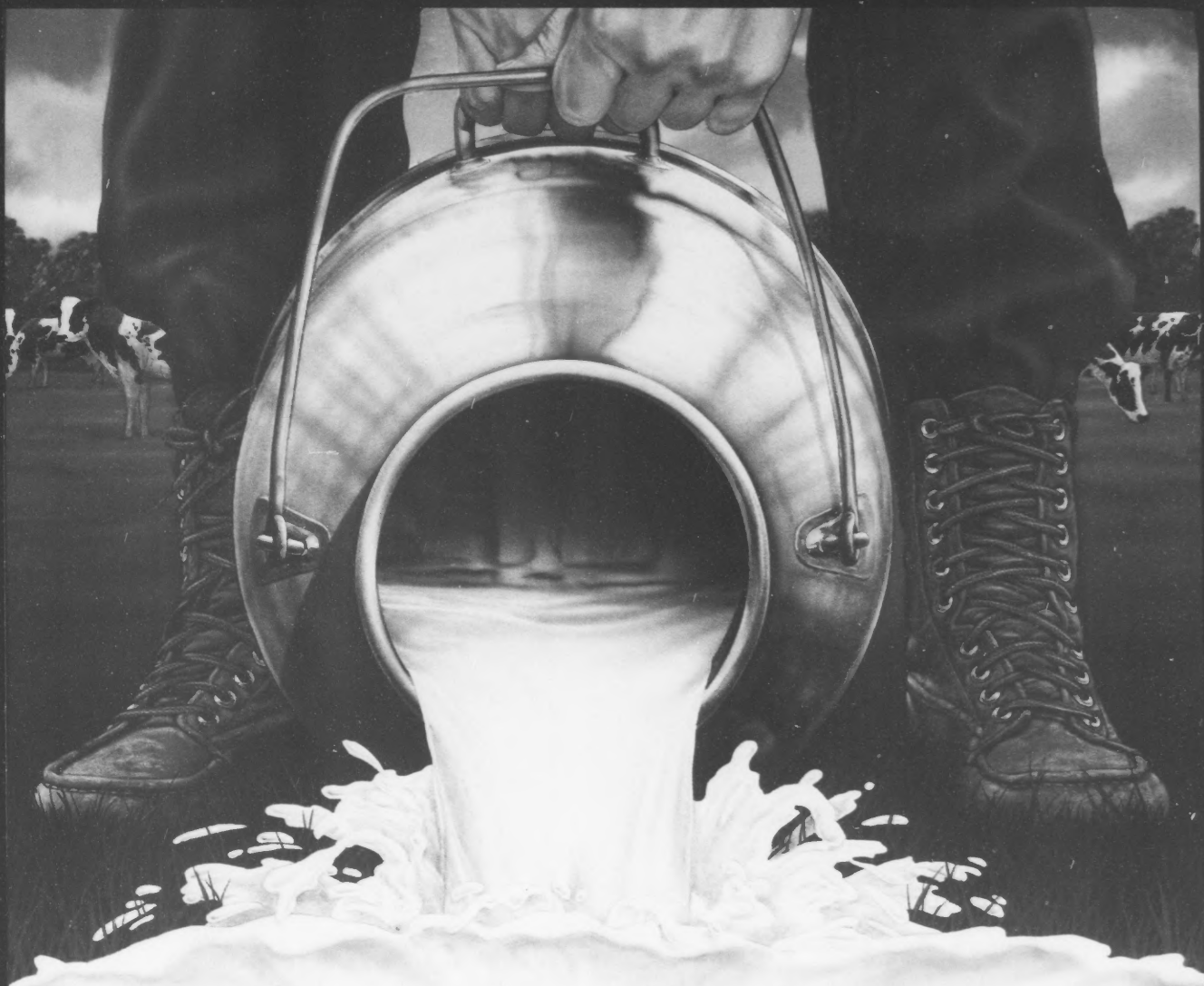
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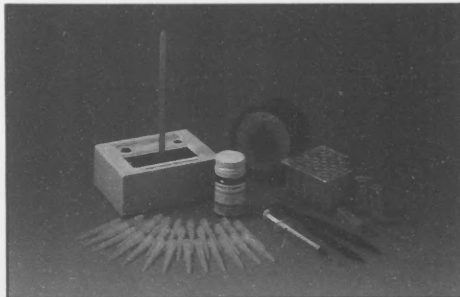
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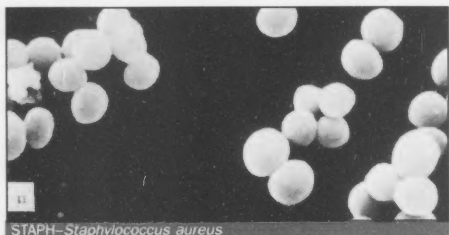
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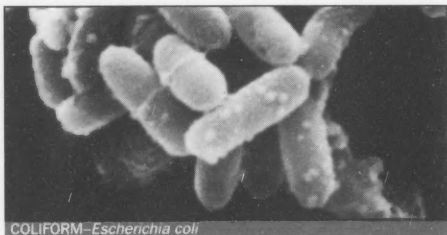
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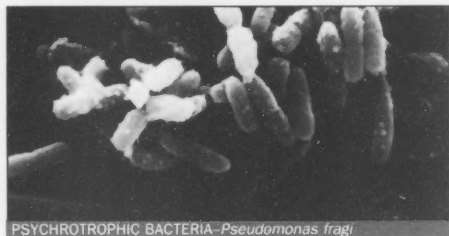
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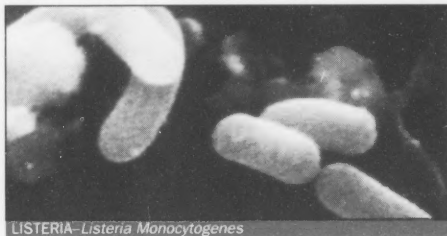
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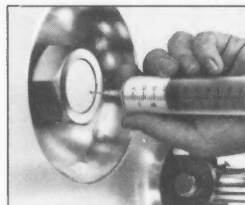


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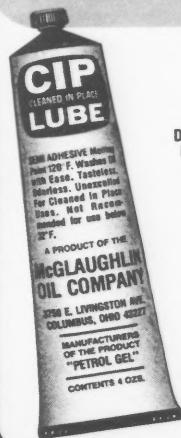
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**Editor's Note:** *Included in this issue of Dairy, Food and Environmental Sanitation, is the Call for Papers for the 82nd IAMFES Annual Meeting, and the Announcement of the IAMFES Developing Scientists Awards. Please turn to the Green Section inserted in the middle of this issue for details.*

ABOUT THE COVER . . . *Photo courtesy of General Mills Restaurants, Orlando, FL.*

ERRATA FOR AUGUST ISSUE... *The 3-A Holders list should have been dated August 20, 1994, not February, 1994.*

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# Thoughts From the President . . .



By  
C. Dee Clingman  
IAMFES President

## Today is the Tomorrow You Thought About Yesterday

Procrastination is in all of us to one extent or another. Like writing this President's Column, which is due into the Des Moines office by a specific day each month; I know the deadline, but the temptation to put it off one more day is often too solace for my own good. But how about food safety? Can we procrastinate one more day?

This year's Annual IAMFES Meeting in San Antonio had the theme "Seize the Moment for Food Safety . . . The Future is Now." Life is now, for tomorrow will be yesterday before you know it. At the San Antonio meeting we had over one-hundred papers, philosophies, challenges, problems, etc. presented to the attendees. Are we as food safety and environmental health professionals ready to go out and tackle the issues confronting our profession? I think we are capable, but are we ready? Are we ready to confront the issues, face society pressures and be labeled a deviant, as we go out to make food safety an essential part of the global social structure?

Some time ago I was reading the proceedings and recommendations of one of the first national conferences in food sanitation and safety. This conference was held in 1947 by the precursor of the National Sanitation Foundation (NSF) of today. That conference was held 47 years ago and the recommendations made back then could be bound in a book labeled 1994 and no one would know the difference. How could that be? Didn't our food safety predecessors do anything in the past 47 years? Food safety issues from 1947 were about education of the industry in sanitary practices, control of additives in milk, regulating pesticides, new emerging pathogens, resistant microbes to sanitizing on stainless steel (biofilms of today) and on and on. You would think we used the 1947 Conference Proceedings to make the agenda for the 1994 Annual Meeting in San Antonio.

While we live in a constantly changing world, we live each day by the same simplistic principals. We need shelter, food and water. That is it! These are the musts of life. As food safety and environmental health professionals we control it all. You might say we can control life itself. Well, maybe not entirely, but close. People like the Rev. Jim Jones demonstrated how to wipe out an entire society of believers with an intentional food poisoning case.

Each of us must **plan** to be part of the future. We must take the challenges of food safety and develop ongoing structures to address them. And most importantly, we must look at **controversy as an opportunity for education**. Lastly, we must move into each day with as much enthusiasm and confidence as possible. We must tell ourselves each day that "what I do today will be very important, because I'm exchanging a day of my life for it."



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# On My Mind . . .



By  
Steven K. Halstead, CAE  
IAMFES  
Executive Manager

. . . is CARS. This has nothing whatsoever to do with sanitation, so if that is a problem for you, please skip to the next topic.

Being as how my son James just turned 16, driving a car has now been added to the other three basic necessities of life: eating, girls and horses. He, of course, thinks that Dad should get him a car. Barring that, he would rather drive my pickup truck than my Volkswagen. Maybe that's in keeping with his country music and love of horses.

Last night, I came up behind a 1947 or '48 Pontiac which had been nicely restored. The "vanity" license plate intrigued me: WEBBLWN. After trying "Webb Lawn" and "Webb Lown," I decided that it stood for "We Be Blown." When I pulled along side it at a stop sign, I could hear the blower (turbo charger) running. I flipped the driver the thumbs up of approval at a job well done only to discover that he was an old guy — about my age.

That got me to thinking. When I was in high school in the late '50s, any high schooler with the slightest mechanical talent (that left me out) drove a "hot rod." Depending on the ability and the resources, that "hot rod" might be nothing more than a loud exhaust system, or it might be a Corvette engine lurking inside a '52 Chevy coupe. The body work was almost as important as the mechanical work.

Maybe my school was different, but it seemed that everyone who owned a car had it "customized" in some way. No two were to be exactly alike. I came from a farming community, so a lot of the guys had access to their dad's machine shop. Some of them were able to do outstanding work.

I don't see "customized" cars as I drive past my son's school. I don't hear him talking about his friends "fixing" up a car. He seldom talks about how fast this car or that car is — critical topics when I was his age. The cars I see in the school parking lot are the usual assortment one might find at any new and used car lot.

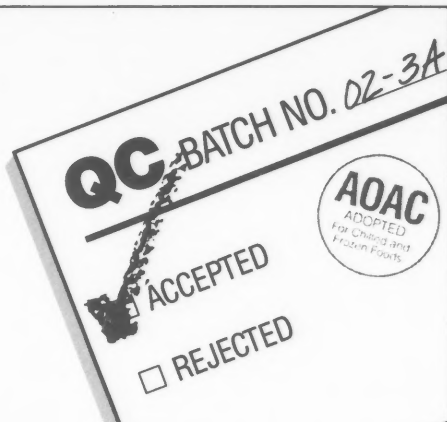
Why don't the kids today "fix up cars?" Have the cars of today become so technical that a kid with a mechanical ability can't work on them? Are we so used to throwing things away, that we don't hesitate to throw away a car? Are the youth of America losing their love of the automobile? Are there just too many other things to do or — and this one scares me the most — are kids just losing or wasting their mechanical aptitude?

We have seen, I believe, a loss of interest in science and math. Maybe this is just an extension of that.

For the sake of tomorrow, I hope not.



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# A Comparative Evaluation of Different Hand Cleansers

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## INTRODUCTION

The potential for foodhandlers to be a vector in transmitting foodborne disease continues to be a significant issue (2,3,5,6,7). Additionally, there continues to be an increasing number of situations where foodhandlers have been implicated as a primary vector in contributing to foodborne illness. Various kinds of foodborne epidemics may be transmitted to consumers via this vector, but gastrointestinal outbreaks are the most commonly reported (4,7).

The microorganisms which normally colonize the hand surfaces pose little threat of infectious disease transmission from foodhandlers to consumers. The threat, instead, comes from "transient" pathogenic microorganisms which contaminate the hand surfaces. In the food industry, contamination usually occurs from contact with one's own excretions or infected areas, or those of others, most commonly through hand to hand transmission. However, food may also become contaminated by food processing personnel via exposure to the feces or raw animal products being processed. The most significant bacteria in this area include species of *Salmonella*, *Shigella*, *Escherichia*, *Yersinia*, *Klebsiella*, *Proteus*, *Clostridium*, *Citrobacter*, *Staphylococcus* and *Streptococcus* (2,4).

Foodborne disease outbreaks result in staggering financial costs, as well as necessitating regulatory processes to assure food safety in the food processing and food service industries. The most effective way to break the contamination vector between foodhandling/processing personnel and consumers is for foodhandlers to perform an effective handwash using an effective hand cleanser.

There is some confusion as to the actual antimicrobial effectiveness of commercially available products. The purpose of this study is to aid food sanitarians in choosing the most appropriate hand cleansing products for their needs. Prior to evaluating any hand cleanser, it is critical that a valid experimental design, as well as valid testing and sampling methods be employed.

The hand sampling methods most commonly used in the food industry to evaluate hand cleanser effectiveness are the "swab" and "finger press" techniques. In brief, the swab sampling method consists of swabbing the palmar hand surfaces as well as between the finger digits with a pre-moistened cotton swab and culturing it on an agar plate. The other

sampling method, the finger press method, is conducted by having the test subjects press their palmar surfaces and/or finger tip pads onto an agar plate. A third method (glove juice), although not widely used in the food industry, is the only method accepted by regulatory agencies for evaluating hand disinfectant products. This "glove juice" method is conducted by having the subject don latex surgical gloves, instilling a microbial stripping solution into the glove, and then massaging the hands and fingers through the glove for 1 min.

The major problem with the first two hand sampling methods is lack of reliability. They are neither accurate nor precise in measuring known quantities of marker microorganisms (5). Accuracy, in this context, refers to the ability of the sampling method to estimate true microbial population. Precision is the ability of the sampling method to repeatedly and closely estimate the true microbial population.

In a study conducted in our laboratory comparing these three hand sampling methods at hand contamination levels of  $10^2$  through  $10^8$ , the glove juice method was the only technique which accurately and precisely measured all of the contamination levels (5). Both the swab and finger press methods grossly underestimated the actual contamination populations, and were also imprecise in repeated estimations of known microbial population numbers (5). Hence, the method of choice is the glove juice sampling procedure.

Additionally, there has been some argument concerning the need to sample the entire hand when mainly the fingers are involved, particularly in fecal contamination. This is a valid argument, but when trying to ascertain the reliability of measuring a known number of microorganisms on the finger tips, the sampling variability is unacceptable, due to the finger tips having such a small surface area. One-hundred-fold accuracy and precision errors are not uncommon (1). Additionally, once the fingers have been contaminated, the contaminating microorganisms are quickly disseminated over the entire palmar surfaces via finger and hand movement. Hence, for reliability, it is suggested that the entire hand surface be measured.

Another problem in evaluating hand disinfectants is that one must know the number of transient microorganisms existing on the hands and not confuse them with the normal or resident microbial populations in order to evaluate the



product's true degerming effects. Recall that the microorganisms encountered on the hand surfaces fall into two categories. The first consists of transient microorganisms "picked up" by foodhandlers. They are called transient for they reside on the hand surfaces only temporarily. The second category (resident bacteria) consists of those microbes which permanently reside on the hand surfaces, e.g., the normal skin flora.

Since it is nearly impossible to reliably quantify the microbial populations of either of these categories, it is simpler and more effective to use a marker microorganism as the transient microorganism. In this study, *Serratia marcescens* was used as a marker organism, because it produces a characteristic red colony that is easily distinguishable from the normal microbial population of the hands, as well as other contaminating microorganisms. The use of *S. marcescens* provides a clear indication of the effectiveness of the handwash without confounding or "mixing up" transient and normal microorganisms.

Additionally, the use of *S. marcescens* is valuable in several other ways. First, it is not normally a pathogenic or disease-producing microorganism so there is little risk of infection to human volunteer subjects. Second, it is as resistant to mechanical removal from the hands as potential pathogens, such as *Escherichia coli*, *Salmonella* sp. and *Shigella* sp. Third, because it is seeded onto the hands at a known population, the antimicrobial properties of the handwash products can be easily and directly compared because the baseline levels for all subjects will be equivalent.

In evaluating handwash products designed mainly to remove transient microorganisms, two parameters of interest are the immediate and persistent antimicrobial effects. The **immediate** antimicrobial effect is the measurement of both the mechanical removal (if a handwash is used) and the immediate inactivation of the microorganisms by the antimicrobial compound (e.g., alcohol, triclosan, parachlorometaxyleneol), if one is used in the product. The **persistent** effect is the measurement of the product's antimicrobial ability to prevent microbial recolonization of the skin surfaces (either by inhibition or lethality) after having used the product.

However, even if a hand cleansing product is effective in removing transient microorganisms, it must also be mild to the skin after many consecutive applications if foodhandlers are to use it. Few people will conform to a handwashing program when the handwash product irritates their hands.

In view of what has been discussed, this study was designed to compare six common handwash product configurations (a non-antimicrobial lotion soap, an antimicrobial lotion soap, an E2<sup>1</sup> sanitizing soap, an alcohol [ethanol] gel sanitizer and combinations of a non-antimicrobial lotion soap used in conjunction with an alcohol gel sanitizer, and an antimicrobial lotion soap used with an alcohol gel sanitizer).

In brief, non-antimicrobial soaps are useful degerming agents because of their ability to assist mechanical removal of

transient microorganisms during a warm water handwash. Antimicrobial soaps, including E2 soaps (usually containing triclosan or parachlorometaxyleneol [PCMX]), have immediate antimicrobial effects mainly due to mechanical degerming during the wash but partly due to the antimicrobial compound used. They also have persistent antimicrobial action due specifically to the antimicrobial compound they contain.

Alcohol and alcohol gels, where alcohol levels exceed 50%, have the most pronounced immediate antimicrobial effects. However, they lack persistent antimicrobial properties. Alcohol gels, which are used without a water wash, have excellent immediate antimicrobial effects. However, without the mechanical removal of the microorganisms via a handwash, there is tendency for microbial build-up upon repeated exposure to contaminating microorganisms. A number of manufacturers recommend a regimen involving the use of both a soap and water handwash to degerm the hands, as well as the use of an alcohol gel to augment the soap's immediate antimicrobial properties.

In this study, we were interested in the immediate and persistent antimicrobial properties as well as the product's irritation to the hands upon repeated use.

## MATERIALS AND METHODS

The six product configurations were used for this study as follows:

Configuration	Regimen	Active Ingredient
1	Non-antimicrobial Lotion Soap	None
2	Antimicrobial Lotion Soap	0.6% PCMX
3	E2 Sanitizing Soap	2.5% PCMX
4	Alcohol Gel Sanitizer	62% Ethanol
5	Non-antimicrobial Lotion Soap plus Alcohol Gel Sanitizer	62% Ethanol
6	Antimicrobial Lotion Soap plus Alcohol Gel Sanitizer	0.6% PCMX plus 62% Ethanol

### Subjects.

Thirty human subjects over the age of 18 but under the age of 70 were recruited for this study. Subjects were of both sexes; all were free of clinically evident dermatoses or injuries to the hands and/or forearms. No known immune compromised subjects were admitted into this study. Subjects were randomly assigned one of the six product configurations. Five subjects per product configuration were used.

### Contaminating microorganism.

*Serratia marcescens* (ATCC No. 14756), red-pigmented strain was used in this evaluation. A 24-h culture of *S. marcescens* with a population of approximately  $1.0 \times 10^8$  colony forming units (CFU) per ml was used. Since *S. marcescens* colonies appear red on the tryptic soy agar

<sup>1</sup> E2 denotes the United States Department of Agriculture (USDA) classification of handwashing and sanitizing compounds which are dispensed from adequate dispensers located a sufficient distance from the processing lines to prevent accidental product contamination. With E2 compounds, the hands need not be washed prior to their use but after use the hand must be thoroughly rinsed with potable water. Additionally, E2 compounds must be used at dilutions applicable as provided on the label instructions. E2 compounds are accepted handwash/hand sanitizing compounds based upon their equivalency of 50 ppm chlorine.

plates, they can be clearly identified as the marker (transient) microorganism. This prevents "mixing up" or confounding the normal and transient microorganisms found on the hands. Any non-red colonies appearing on the agar plates were not counted.

#### Pre-test period.

The first 7-day period of this study was designed the "pre-test period." During this period, subjects avoided using medicated soaps, lotions, detergents, acids and bases. Bathing in chlorinated pools and hot tubs as well as using ultraviolet (UV) light tanning beds were prohibited. This regimen allowed for stabilization of the normal microbial flora of the hands.

#### Experimental period.

The second 7-day period (following the "pre-test" period) constituted the experimental period. Each subject was utilized 1 day of that week for approximately 4 to 5 h. During this period, 5 ml portions of the *S. marcescens* culture were pipetted into each subject's cupped hands. The inoculum was then distributed evenly over both hands and the area comprising approximately one-third of the forearm, via gentle massage. After a 1 min air dry, the glove juice sampling procedure was performed.

The first microbial inoculation cycle constituted the baseline sample. It assured that all of the microorganisms inoculated onto the subjects' hands could be removed. It was followed by a reinoculation of the microorganisms and use of the assigned hand cleansing product configuration. The microbial inoculation/assigned product use procedure was repeated 10 consecutive times with a minimum of 5 min between cycles. A transient microorganism count of the hands was performed following washes 1, 3, 7 and 10, using the glove juice sampling procedure.

#### Wash procedure.

Three milliliters of each hand washing product was dispensed into each subject's hands. Each subject washed for 20 s, rinsed for 30 s with lukewarm water, and allowed their hands to dry thoroughly. The alcohol gel (3 ml) was applied to dry hands, rubbed to distribute evenly, and allowed to dry for 5 min before sampling. No water wash was used in conjunction with the alcohol gel product.

#### Glove juice sampling procedure.

Following the prescribed wash and rinse, non-powdered, sterile surgical gloves were donned. Seventy-five milliliters of a sterile aqueous phosphate buffer (pH 7.8) solution containing 0.1% Triton X-100 were instilled into the glove. The glove was secured at the wrist and the hand massaged through the glove for 60 s. Portions of the "glove juice" were removed and serially diluted in Trypticase Soy Broth (TSB) containing 1.0% Tween 80 and 0.3% Lecithin as neutralizing agents. Duplicate Trypticase Soy Agar (TSA) spread plates containing 1.0% Tween 80 and 0.3% Lecithin were prepared for each dilution. The plates were incubated at 30 to 35°C until a distinguishable red color developed. Those plates providing between 25 and 250 red pigmented colonies were utilized in this study. The number of viable red pigmented bacteria recovered was determined using the formula:

$$B = A \left[ \frac{\sum x}{n} \right] 10^D$$

Where:

B = estimated number of microorganisms

A = portion volume = 75 ml

$\frac{\sum x}{n}$  = average colony forming unit count of the agar plates for each dilution level

D = dilution level

Since the data collected in this study were on the exponential scale, in order to linearize the data, each B value was transformed into the  $\log_{10}$  scale. This linearization process was a requirement of the statistical models employed.

#### Irritation study.

After microbial inoculation/product use cycle ten, the subjects entered the irritation potential phase of the study. The subjects continued to wash their hands with their assigned product configuration for 15 more consecutive washes/product applications, for a total of 25 washes. There was a minimum of 5 min and a maximum of 15 min between washes/product applications. The subjects' hands were examined for irritation after washes 15, 20 and 25, or at the first sign of irritation. Irritation was scored according to Table 1. The entire study took about 6½ h to perform.

TABLE 1. Hand irritation scoring system.

Erythema: (redness)	0 = No reaction
	1 = Mild and/or transient redness limited to sensitive areas
	2 = Moderate redness persisting over much of the product-exposed area
	3* = Severe redness extending over most or all of the product-exposed area
Edema: (swelling)	0 = No reaction
	1 = Mild (just perceptible)/ transient
	2 = Moderate - definitely palpable
	3* = Severe
Rash:	0 = No reaction
	1 = Mild - few, small eruptions
	2 = Moderate - scattered eruptions > 10/hand
	3* = Severe
Dryness: (redness)	0 = No reaction
	1 = Mild - transient, generally limited to cuticles, knuckles
	2 = Moderate - persistent, extending over much of the hand
	3* = Severe - persistent, extending over most of the hand, characterized by cracking and roughness

\* Represents significant irritation and requires subject's removal from study.

## RESULTS

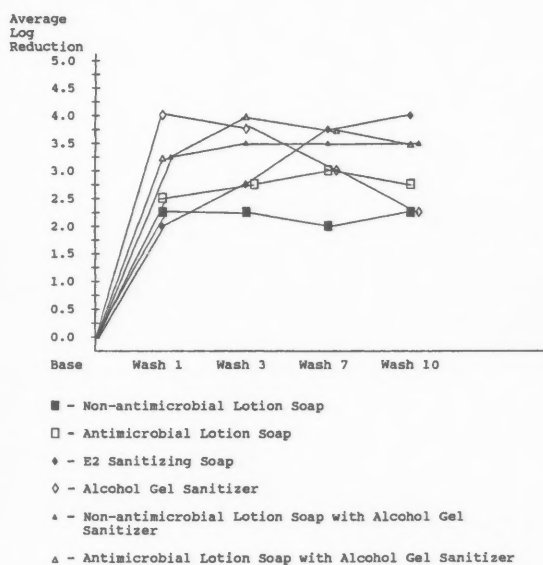
Figure 1 represents the results in graphic form and Table 2 presents the data in  $\log_{10}$  reductions from the baseline as well as percent reduction from baseline form.

As can be seen in Fig. 1 and Table 2, each of the six product configurations was highly statistically significant in reducing the baseline population by at least two logs ( $p < 0.05$ ).

### Non-antimicrobial lotion soap.

The non-antimicrobial lotion soap reduced the baseline microbial counts by about two logs (99.00%) after the first wash. Upon repeated microbial inoculations and washes, the product configuration was capable of keeping the contaminating microorganism counts down by nearly two logs (99.00%) from the baseline value over the course of the ten inoculation/wash cycles.

Figure 1. Graph of the six product regimen efficacies over time.



### Antimicrobial lotion soap.

The antimicrobial lotion soap reduced the initial microbial counts after the first inoculation/wash cycle by approximately 2.5 logs (99.68%) and demonstrated antimicrobial consistency over the ten consecutive inoculation/wash cycles.

### E2 sanitizing soap.

The E2 sanitizing soap reduced the baseline microbial population by nearly two logs (99.00%) after the first wash. After the third inoculation/wash, the product was able to reduce baseline microbial populations by 3 logs (99.90%), after the seventh inoculation/wash cycle by 3.75 logs (99.98%), and by wash ten, nearly 4 logs (99.99%). As the product was used repeatedly over time, it demonstrated increasing antimicrobial effectiveness.

### Alcohol gel sanitizer.

The alcohol gel sanitizer achieved approximately a 4-log (99.99%) reduction in microorganism from baseline after the first inoculation/product application cycle. But, since it is applied without the use of a water wash, a slight but continuous build-up in microorganism populations was noted. Even so, after inoculation/application number ten, the microbial populations were still at least two logs (99.00%) below the baseline value ( $p < 0.05$ ).

### Non-antimicrobial lotion soap with alcohol gel sanitizer.

The non-antimicrobial lotion soap and the alcohol gel sanitizer, when used in conjunction with each other, reduced the baseline counts about 3.25 logs (99.94%). After the first inoculation/product use cycle, and from inoculation/product use cycles three, seven, and ten, the microbial counts were kept down from baseline by greater than 3.5 logs (99.97%).

### Antimicrobial lotion soap with alcohol gel sanitizer.

The antimicrobial lotion soap in conjunction with the alcohol gel sanitizer, after the first inoculation/product use wash cycle, provided about a 3.25 log (99.94%) reduction from baseline and remained at about 3.5 logs (99.97%) for the remainder of the ten inoculation/product use cycles.

### Irritation.

No significant skin irritation was observed over the 25 consecutive wash/product application cycles with the non-antimicrobial lotion soap, the antimicrobial lotion soap or the alcohol gel sanitizer. Neither of the soaps used in conjunction with the alcohol gel sanitizer produced any significant skin irritation over the course of the 25 handwashes.

Mild irritation consisting of the transient redness (score of 1 on the scoring system) and generalized dryness (score of 1 on the scoring system) was observed with the E2 Food Industry Sanitizing Soap.

## DISCUSSION

Although each of the six product configurations was effective in reducing transient microbial population levels on the hands, the overall results illustrate the range and complexity involved in setting an effective hand hygiene regimen for the foodhandling environment. Each configuration has associated advantages and disadvantages.

The non-antimicrobial soap illustrates the generally sound principle of standard hand washing for hygiene purposes. This configuration showed that mechanical removal of transient skin bacteria is relatively effective and consistent, but perhaps not optimum. Importantly, no skin irritation was found from this regimen.

The antimicrobial lotion soap was statistically more effective than the plain soap in both immediate and persistent antimicrobial properties. A properly formulated general purpose antimicrobial soap can exhibit both effective removal/kill of transient bacteria and low skin irritation and, thus, can be considered as an alternative to plain non-antimicrobial soaps.

The E2 sanitizing soap was very effective in both immediate and persistent antimicrobial effects, providing sustained high log reductions in transient organisms. However, these types of soaps typically show more aggressive skin effects, as was found in this study. Skin irritation can increase resistance to handwash compliance, so the use scenario in total must be evaluated when considering an E2 product.

The alcohol gel sanitizer was, as expected, the most immediately effective product in reducing microorganism populations. It is the product of choice when transient organism contamination is possible, and water is not available for a thorough hand wash. It is also preferred in situations where

TABLE 2. Log percent reduction values from baseline.

Product Configuration	Mean Log <sub>10</sub> Baseline Value	Standard Deviation	Mean Log <sub>10</sub> Reduction From Baseline Wash 1	Standard Deviation	Percent Reduction From Baseline Wash 1	Mean Log <sub>10</sub> Reduction From Baseline Wash 3	Standard Deviation	Percent Reduction From Baseline Wash 3	Mean Log <sub>10</sub> Reduction From Baseline Wash 7	Standard Deviation	Percent Reduction From Baseline Wash 7	Mean Log <sub>10</sub> Reduction From Baseline Wash 10	Standard Deviation	Percent Reduction From Baseline Wash 10
1	7.98	.27	2.29	.52	99.49%	2.09	.63	99.19%	1.96	.72	99.90%	2.09	.68	99.12%
2	7.98	.27	2.58	.22	99.66%	2.73	.41	99.81%	2.91	.63	99.88%	2.76	.27	99.83%
3	7.98	.27	1.99	.12	99.98%	2.81	.29	99.84%	3.72	.43	99.98%	3.99	.59	99.99%
4	7.98	.27	3.93	.04	99.99%	3.79	.15	99.98%	2.96	.27	99.89%	2.15	.13	99.29%
5	7.98	.27	3.27	.14	99.95%	3.70	.18	99.98%	3.64	.23	99.98%	3.62	.29	99.98%
6	7.98	.27	3.28	.13	99.95%	4.13	.23	99.99%	3.74	.27	99.98%	3.66	.17	99.98%

- 1 = Non-antimicrobial Lotion Soap
- 2 = Antimicrobial Lotion Soap
- 3 = E2 Sanitizing Soap
- 4 = Alcohol Gel Sanitizer
- 5 = Non-antimicrobial Lotion Soap with Alcohol Gel Sanitizer
- 6 = Antimicrobial Lotion Soap Alcohol Gel Sanitizer

one cannot continually wash his/her hands. Although the alcohol gel maintains significant log reductions over a series of hand washes, the data trend suggests that it be supplanted with an antimicrobial or non-antimicrobial hand wash product after three to five consecutive uses. Use of the alcohol gel showed low skin irritation, comparable to that of the plain soap.

### LIMITATIONS

This study provides food service professionals with information and guidelines to help choose effective hand cleansing products and regimens that reduce the risk of foodhandler-vectored infections. However, it is the responsibility of the end user to assure the products are utilized appropriately and regimens are adhered to as required as appropriate to each situation.

A potential limitation of this study is that it was conducted in a laboratory setting, rather than under actual field conditions. However, correlation between the glove juice test results and actual field results has been established by extensive studies in the healthcare industry. The fact remains that glove juice testing is the only methodology accepted by regulatory agencies for demonstration of handwash efficacy. Further, any study, field or otherwise, must use accurate and valid techniques before correct conclusions can be drawn. The glove juice procedure has been shown to be accurate and precise while many other methods have not.

### CONCLUSION

The most effective product regimens, from an overall microorganism reduction profile as well as a skin irritation standpoint, were the combinations of alcohol gel with antimicrobial or plain lotion soap. Both of these configurations

showed tremendous immediate transient organism reduction due to mechanical degerming by the soap hand wash coupled with the alcohol's tremendous immediate antimicrobial properties. Both regimens also demonstrated persistent antimicrobial properties.

Effective hand washing is a cornerstone in preventing foodhandler-borne illness. A second key issue is selection of effective hand cleansing product. The interaction of the product regimen selected and a well-managed handwashing/sanitizing program, which includes compliance measurement, provides the key to assuring the safety of the American food supply.

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# HYcheck™ Slides versus Rodac® Plates Compared to the Swab Technique for the Recovery of Bacteria from Hard Smooth Surfaces

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## ABSTRACT

HYcheck™ slides, Rodac® plates and the swab method were compared for the enumeration of *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Escherichia coli* artificially contaminated on stainless steel and Formica surfaces before and after sanitizing with 200 ppm of chlorine. The *r* between methods were: swab versus Rodac® plate (0.81); swab versus HYcheck™ slide (0.84); and Rodac® plate versus HYcheck™ slide (0.89). All calculated *r* were statistically significant with respect to the number of samples tested. This data suggests that the HYcheck™ slide can be used as an alternative method to estimate the surface microbial contamination.

## INTRODUCTION

The ability to determine the degree of contamination on food contact surfaces, walls, ceilings and equipment using an easy and relatively accurate procedure is of utmost importance in the food industry. Periodic sampling of these areas is essential to ascertain the effectiveness of the sanitary procedures, microbial buildup during processing and effectiveness of equipment breakdown during cleaning just to mention a few. Without accurate information obtained from the surface sampling procedures, an increased public health risk could occur, as well as adverse effects to the organoleptic characteristics of the food products during the normal storage period.

Accurate surface sampling begins with the selection of an appropriate method. Depending on the type of surface, kind of equipment being used, sampling site and the genera to be enumerated, the American Public Health Association recommends using the cellulose sponge technique, the swab procedure, or the replicate organism direct agar contact (Rodac®) plate method (3,16). In addition, other methods or devices have been developed to enumerate surface microbes which include: the agar sausage technique (6), adhesive tape (5), prehydrated Petrifilm™ plates (9), contact-transfer method (15) and contact slides (7,10,11). The Rodac® plate compares

favorably to the swab method where the technique of choice depends primarily on the surface type and the level of contamination (1,12,14). Contact slides were developed to enumerate bacteria in urine using coated (one bacteriological medium) microscope slides immersed directly in the urine (8). In the food industry, contact slides have been used to enumerate bacteria in liquid foods, such as milk (10) and determine the relative bacterial load on the surfaces of equipment (7), foods and in the food environment (11). In 1991, Difco released a version of the contact slide called HYcheck™ in the United States, which contain either the same or two different media on one-hinged slide. In this investigation the Rodac® plate, the HYcheck™ slide and the swab method were compared using three bacterial strains artificially spread on two surfaces before and after sanitizing with chlorine.

## MATERIALS AND METHODS

### *Bacterial strains and preparation of inocula.*

*Escherichia coli* ATCC 25922, *P. aeruginosa* ATCC 15422, and *S. aureus* ATCC 6538 were used in this investigation. Cultures were maintained on Difco Brain Heart Infusion (BHI) agar slants, stored at 4 to 6°C, and transferred every month. A loopful of cells from a slant was aseptically transferred to 20 ml of Difco BHI broth and incubated for 24 h at 35°C. The cells were centrifuged at 1,450 x *g* for 30 min at room temperature. Each cell pellet was resuspended in 20 ml of sterile saline. Further dilutions in sterile saline were made to establish various cell concentrations for each organism. The washed cells were chilled prior to use.

### *Surface spreading of cells and sanitizer preparation and application.*

Two sterile cotton swabs in tandem were used to evenly spread 2 ml-volumes of each of the cell suspensions (3 cellular concentrations) on duplicate 30.5 cm x 45.7 cm rectangular areas delineated on counter tops (Formica and stainless steel). These counter tops were previously sterilized



with 70% ethanol and air dried before applying the bacterial cells.

A 5.54% stock solution of sodium hypochlorite (Fisher Scientific Co., Pittsburgh, PA) was diluted 1:227 (vol/vol) with deionized water to yield a solution containing the equivalent of 200 ppm of free chlorine as determined by the iodometric method I (4). This sanitizer was applied by wiping the surface of the rectangle for 10 s with two folded paper towels (Aristicrat™ single fold towels, Wisconsin Tissue, Menasha, WI) previously saturated with 14.2 ml (10 ml on one side and 4.2 ml on the other) of the diluted chlorine solution.

#### Microbial sampling of cells dried on the two surfaces.

Each sampling procedure was performed in duplicate for each inoculated rectangle. A sterile cotton swab previously moistened in Difco D/E Neutralizing Broth was used to sample an area of 50.0 cm<sup>2</sup>. The inoculated swabs were placed in 10 ml of D/E Neutralizing Broth as the initial diluent and appropriate dilutions for plating were made with sterile deionized water. The swabbing procedure was performed both before and after the application of the chlorine sanitizer.

Difco HYcheck™ slides and BBL Rodac® plates were used per manufacturers' directions to determine the degree of bacterial contamination on the Formica and stainless steel surfaces. Before the sanitizer was applied to the surface, HYcheck™ slides and Rodac® plates containing tryptic soy agar and trypticase soy agar with lecithin and polysorbate 80, respectively, were used for bacterial enumeration. After the cells were exposed to the chlorine sanitizer and the surface was air dried (approximately 10 min), HYcheck™ slides containing D/E Neutralizing agar and Rodac® plates containing trypticase soy agar with lecithin and polysorbate 80, and D/E Neutralizing agar were applied to the surfaces. The HYcheck™ slides and Rodac® plates sampled surface areas of 7 and 25 cm<sup>2</sup>, respectively.

Bacteria recovered by the swabbing method were enumerated on Difco tryptic soy agar plates in duplicate using the pour plate technique. HYcheck™ slides, Rodac® plates, and tryptic soy agar plates were incubated at 35°C for 24 h. Plates were counted directly or with the aid of a Quebec Colony Counter.

#### Statistical analyses.

For the number of bacteria recovered by the swab technique and HYcheck™ slides, the data were converted to the number of bacteria enumerated per a 25-cm<sup>2</sup> area. This conversion will allow a direct statistical comparison among the three methods. For samples where the number of bacteria recovered were too dense to count for any of the three enumeration techniques, the data were eliminated. Data from before and after sanitizing for the three bacterial strains were combined when comparing the three sampling techniques. Since the Rodac® plates containing trypticase soy agar with lecithin and polysorbate 80 and D/E Neutralizing agar recovered a similar number of bacteria after sanitizing for the three bacterial strains, the two media were combined. Standard regression methods were used to calculate least-squares regression lines and *r*. Significant tests of the correlation analyses were calculated by using the statistical hypothesis test and the standardized normal density function (2).

## RESULTS

Figures 1 and 2 compare the Rodac® plate and HYcheck™ slide method with the swab technique in recovering three bacterial strains spread on Formica and stainless steel surfaces. When comparing Rodac® plates with the swab method the regression line had a slope of 2.008 and an intercept of 23.66 (Fig. 1), whereas, with the HYcheck™ slides versus the swab method, the slope and intercept was 2.372 and 2.7, respectively (Fig. 2). Correlation coefficients of 0.81 and 0.84 for the Rodac® plate and HYcheck™ slide, respectively, indicate a linear relationship between the two methods and the swab procedure. The calculated *r* were found to be statistically significant.

The direct comparison of Rodac® plates to HYcheck™ slides for the recovery of the three bacterial strains from two smooth surfaces is illustrated in Fig. 3. The regression line had a slope of 0.701 and an intercept of 8.0. The *r* (0.89) indicates a strong linear relationship between Rodac® plates and HYcheck™ slides and was statistically significant with respect to the number of samples tested.

Figure 1. Linear regression analysis of the Rodac® plate plotted against the swab method (count/25 cm<sup>2</sup>) for the recovery of three bacterial strains artificially contaminated on stainless steel and Formica surfaces.

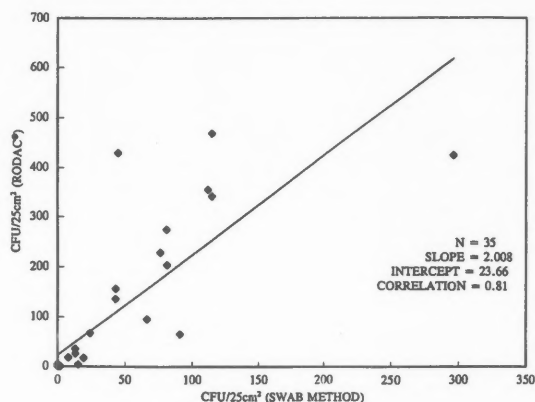


Figure 2. Linear regression analysis of the HYcheck™ slide plotted against the swab method (count/25 cm<sup>2</sup>) for the recovery of three bacterial strains artificially contaminated on stainless steel and Formica surfaces.

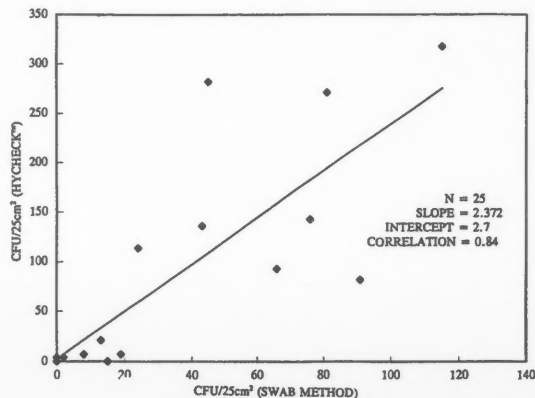
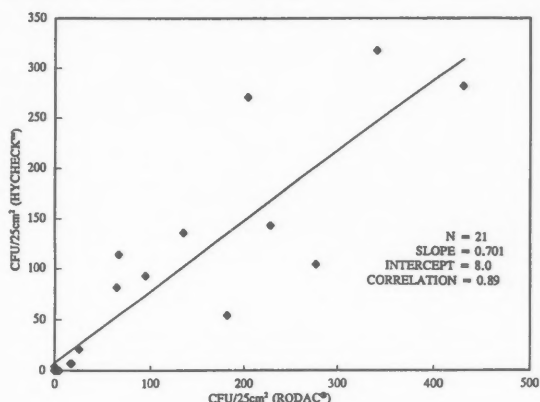


Figure 3. Linear regression analysis of the HYcheck™ slide plotted against the Rodac® plate (count/25 cm<sup>2</sup>) for the recovery of three bacterial strains artificially contaminated on stainless steel and Formica surfaces.



## DISCUSSION

Various studies have shown that the contact agar plate, specifically the Rodac® plate, has compared favorably with the swab method for determining the relative bacterial load on different surfaces and solid food products (1,5,12,14). This investigation has shown an alternative procedure for isolating surface microbes using the HYcheck™ slide. For sampling bacteria from a smooth surface, the HYcheck™ slide is as effective as the swab method (Fig. 2). In addition, Scott et al. (13) showed that the contact plate (Rodac®) and contact slide (MacConkey agar) were comparable to the swab method in estimating the bacterial level from the surfaces of various sites and equipment in the home. A close linear relationship existed between the HYcheck™ slide and Rodac® plate for recovering several bacteria from smooth surfaces (Fig. 3).

Therefore, similar to the Rodac® plate, HYcheck™ slides provide a simplified method to estimate the level of surface microbial contamination on equipment and other similar inanimate objects. Additionally, the HYcheck™ slide is more versatile than the Rodac® plate in that it can be used to determine the relative bacterial density in homogeneous liquid food product (10), and on curved surfaces where a simple rolling motion can be used to make an impression (7). Also, when two different media are used on the same HYcheck™ slide, the option allows for the enumeration of two bacterial groups simultaneously. Further investigations are necessary to establish the overall feasibility of the HYcheck™ slide technique for the estimation of microbial levels on the surfaces of various foods, in liquid products and on rough surfaces.

## ACKNOWLEDGMENTS

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# Legionellae in the Environment in Singapore

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## ABSTRACT

We investigated a total of 3,939 environmental specimens for Legionellae over a 1-year period, from August 1992 to July 1993. A total of 389 specimens (9.9%) were found positive for *Legionella*. These positive samples were cooling tower waters, fountain water and swabs from shower heads and humidifiers. The predominant species isolated was *Legionella pneumophila*, in particular *L. pneumophila*, serogroup 1. Multiple strain specimens were also found.

Isolation of Legionellae was done by the culture method while speciation and serogrouping were done by the immunofluorescence technique and/or slide agglutination or latex agglutination.

## INTRODUCTION

There are now more than 30 species and 50 serogroups of Legionellae and at least 19 species have been implicated in human disease (9). Legionellae are ubiquitous in natural fresh water habitats and have been isolated from lakes, rivers, streams, ponds, ground water, etc. From these sources, they gain entry and colonize man-made water systems such as cooling towers, evaporative condensers and potable water distribution systems. Aerosols generated from these artificial aquatic environments serve as the major source for disease. Legionellae present in water droplets of 5 to 15  $\mu$ l can readily enter the respiratory tract and colonize the alveolar airspaces of the lung, infect the alveolar macrophages and induce disease.

During the period of our study from August 1992 to July 1993, a total of 3,939 environmental specimens were received for investigation of Legionellae. These specimens were from many sites and were submitted as part of a routine surveillance or maintenance check on buildings and were in no way associated with outbreaks or endemic cases of legionellosis.

The study was undertaken to investigate the sites of Legionellae in our environment as well as to find out the predominant strains of Legionellae in our environment.

## MATERIALS AND METHOD

A selective isolation procedure was used to isolate Legionellae from the specimens. Water samples were first concentrated 100 folds using the Membrane filter technique.

After appropriate treatments, portions of the concentrated samples were then plated onto Charcoal Yeast Extract (CYE) agar supplemented with cysteine and ferric ions and with antimicrobials (Oxford Ltd., Basingstoke, England). Heat treatment was carried out at 50°C for 30 min. Acid treatment was carried out using pH 2.2, HCl-KCl buffer for exactly 5 min. Swabs were first soaked in 1 ml sterile distilled water and 0.1 ml of the suspension was then plated after heat treatment.

The agar plates were incubated at 37°C and examined on the 3rd day and then at regular intervals up to 10 days. They were also examined for auto-fluorescence under ultraviolet (UV) light at 366 nm. Suspicious *Legionella* colonies were subcultured onto blood agar, CYE agar and CYE agar supplemented with cysteine and ferric ions. Those which showed no growth on blood and CYE agars were presumptively identified as Legionellae. Speciation and serogrouping were then done by direct fluorescent antibody (DFA) technique, slide agglutination and latex agglutination.

The direct fluorescent antibody technique was done using Polyvalent and Monovalent DFA Conjugates available from Marx Diagnostics (USA), DFA Monoclonal Antibody reagent from Sanofi Diagnostics, Pasteur (France). Slide agglutination was done using grouping sera from Denka Seiken (Japan) while latex agglutination was done using Serobact Rapid Latex Agglutination Kit (Australia). Protocols provided by the manufacturers were followed.

## RESULTS

Table 1 gives a breakdown of the different sites from which the water samples and swabs were taken for this study. It also shows the distribution of positive samples. Out of 3,939 samples tested, 389 (9.9%) were found to be positive for *Legionella*.

The types of positive samples are shown in Tables 2 and 3. The majority of the positive samples showed the presence of single *Legionella* strains, the predominant one being *L. pneumophila*. However, 41 (10.5%) of the positive samples were multiple strain samples. Thirty-one of these samples showed the presence of two different serogroups of *L. pneumophila* while the remaining 10 samples showed the presence of one *pneumophila* and one *non-pneumophila* strain (Table 3).

TABLE 1. *Types of samples.*

Sites of Samples	Nature of samples	Number of samples tested	Number of positive samples
Cooling water	Water	3566	376
Fountain	Water	9	1
Taps	Water	7	0
Chiller	Water	2	0
Air-conditioner	Water	4	0
Pond	Water	3	0
Taps	Swabs	4	0
Shower heads	Swabs	237	8
Humidifiers	Swabs	83	4
Nebulizers	Swabs	12	0
Respirators	Swabs	4	0
Air Outlet	Swabs	2	0
Sewage treatment	Swabs	6	0
	TOTAL	3939	389

TABLE 2. *Types of positive samples.*

Types of strains isolated	Number of positive samples	% positive (to the nearest)
<i>Single strain</i>		
<i>Legionella pneumophila</i>	305	78.4
<i>Legionella species</i>	10	2.6
	<i>Legionella bozemanii</i> : 6 <i>Legionella dumoffii</i> : 4	
<i>Legionella-like organisms</i> (Unable to identify but <i>Legionella pneumophila</i> , <i>Legionella micdadei</i> , <i>Legionella dumoffii</i> , <i>Legionella bozemanii</i> , <i>Legionella gormanii</i> , <i>Legionella longbeache</i> , <i>Legionella jordanis</i> were ruled out).	33	8.5
Multiple strains	41	10.5
TOTAL	389	100.0

TABLE 3. *Types of multiple strain samples.*

Types of strains isolated	Number of samples
<i>Legionella pneumophila</i> serogroups 1 and 7	17
serogroups 1 and 5	4
serogroups 1 and 2	2
serogroups 5 and 7	2
serogroups 3 and 7	2
serogroups 6 and 7	1
serogroups 1 and unknown serogroup *	2
serogroups 7 and unknown serogroup *	1
<i>Legionella pneumophila</i> serogroup 5 and <i>Legionella bozemanii</i>	1
<i>Legionella pneumophila</i> serogroup 1 and <i>Legionella-like organisms</i>	7
<i>Legionella pneumophila</i> serogroup 5 and <i>Legionella-like organisms</i>	2
TOTAL	41

\* Unable to identify because the relevant antisera were not available commercially. However, *L. pneumophila* serogroups 1 to 7 were ruled out.

TABLE 4. *Prevalence of the different serogroups of Legionella pneumophila.*

<i>Legionella pneumophila</i>	No. of Positive samples	% Positive
Serogroup 1	181	59.3
Serogroup 7	65	21.3
Serogroup 5	26	8.5
Serogroup 6	9	3.0
Serogroup 10	7	2.3
Serogroup 3	4	1.3
Serogroup 4	1	0.3
Serogroup 8	1	0.3
Serogroup 13	1	0.3
Unknown serogroup*	10	3.3
TOTAL	305	100.0

\* Unable to identify because the relevant antisera were not available commercially. However, *L. pneumophila* serogroups 1 to 7 were ruled out.

Table 4 illustrates the presence of the different serogroups of *L. pneumophila*. Out of the 305 single *L. pneumophila* strains isolated, *L. pneumophila* serogroup 1 was the most predominant (59.3%), followed by *L. pneumophila* serogroup 7 (21.3%) and *L. pneumophila* serogroup 5 (8.5%), respectively. The 10 positive samples with unknown serogroups of *L. pneumophila* could not be identified because the relevant antisera for immunofluorescence work were not available commercially. They were also not sent to a Public Health Laboratory in the United Kingdom which actually investigated and identified the *L. pneumophila* serogroups strains 8, 10 and 13 using the immunofluorescence technique.

### DISCUSSION

Our investigation revealed the presence of Legionellae in the environment in Singapore. While the positive rate was not alarmingly high (9.9%), the presence of Legionellae in our cooling towers, shower heads, fountain and humidifiers should not be taken too lightly as outbreaks of Legionellosis or Legionnaires' disease have been reported from such sites (1,2,3,4,5,7).

The predominant strain isolated was *L. pneumophila*, in particular serogroup 1. This strain is known to account for more than 80% of cases of Legionellosis. Even *Legionella dumoffii* and *Legionella bozemanii* which we isolated, have been frequently identified as a cause of illness (6,8).

Only sporadic cases of Legionnaires' disease have been detected in Singapore. Previous workers have also found that significant numbers of cooling-towers are colonized by Legionellae without apparently causing illness. Nevertheless, it would be prudent to bear in mind that *Legionella* is an important cause of serious community and hospital-acquired pneumonia occurring sporadically and in outbreaks. Legionellae will never be eradicated from the environment and patients with decreased host defenses will always be with us. As long as this situation exists, the risk of Legionellosis or Legionnaires' disease will remain.

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# Foodborne Illness (Part 11)

## *Yersiniosis*

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*Yersinia enterocolitica* is the bacterium which causes this illness syndrome. It is a growing concern to public health personnel and food processors. It is an "emerging" foodborne pathogen, having been recognized as a human pathogen in 1939, but only identified as being foodborne in the mid 1970's.

*Yersinia enterocolitica* comprises over 50 serotypes and five biotypes, with many being non-pathogenic. Type O:8 strains have generally been responsible for most outbreaks in the U.S, with type O:3 recently becoming most prominent in New York. The agent is a non-sporeforming bacillus and is a psychrotroph, growing as low as 32°F (0°C) and as high as 111.2°F (44°C), with the optimum being 89.6 to 93.2°F (32 to 34°C); it will grow in a pH range of 4.6 to 9.0 and is sensitive to heat (122°F, 50°C) and salt (>7%).

The organism has been isolated from many animal species, with most isolates being avirulent for humans. Exceptions are swine; they are the principal reservoir for virulent strains, which are often isolated from the oral cavity (tongues and tonsils) of apparently healthy animals. Food surveys have shown that the organism is widely distributed: beef, lamb, oysters, crabs, shrimp and water. Outbreaks caused by the agent have included chocolate milk (NY, 1976), tofu (WA, 1981-82), pasteurized milk (TN, AR, MS, 1982), and pork chitterlings (GA, 1988).

Yersiniosis is most commonly seen in the form of a gastroenteritis. Symptoms can include watery diarrhea, intense abdominal pain (can mimic appendicitis), headache, fever and vomiting. Symptoms can be more severe in younger children, with this group and young adults being more susceptible to yersiniosis. Since about 20% of *Yersinia* infections seem to mimic acute appendicitis in children and adolescents, unnecessary appendix operations have been performed. The uncomplicated disease is self-limiting, with complete recovery, but some complications can occur. Post-infectious arthritis can be severe in adolescents and older adults, while septicemia may occur among persons with an iron overload (e.g., hemochromatosis) or those immunocompromised; inflammations of various body parts may occur, including the

skin (erythema nodosum), brain (meningitis) and intestine (terminal ileitis). The incubation period is usually between 24 to 36 h, sometimes longer; illness duration is usually 1 to 3 days. Fecal shedding can continue at least as long as symptoms exist.

Foodborne transmissions is of the fecal-oral type by ingesting and/or drinking contaminated foods and water. Contact transmission from infected humans and animals can occur; human cases have occurred from infected household pets, particularly puppies and kittens.

### CONTROL

The outbreak patterns observed have indicated that post-processing contamination is a main cause of illness. Since refrigeration does not prevent growth of *Yersinia*, basic food protection and sanitation practices need to be emphasized.

Some specific measures include:

- Handle (prepare) meat, especially pork products, and other foods in a sanitary manner; review handling procedures to prevent cross-contamination from utensils, equipment, food-contact surfaces and a worker's hands; care needs to be taken to avoid contamination of ready-to-eat foods.
- Since the organism grows well in refrigerated food, these foods need to be thoroughly cooked/reheated to temperatures that will destroy the pathogen. Previously cooked foods stored in the refrigerator several days need thorough and rapid reheating (>165°F, 74°C) before being offered for consumption/sale.
- Personal hygiene. Wash hands prior to foodhandling and eating and after handling raw products, especially pork and other meat products.
- Protect water supplies from animal and human fecal waste; treat water; if necessary, to make it potable.

In summary, these control measures require using cooking/reheating methods to kill the organism, with attention given to cleanliness of the kitchen area and the practice of using good personal hygiene methods, with the emphasis on thorough and effective handwashing.

## HACH COMPANY EARNS ISO 9000 REGISTRATION

Hach Company is pleased to announce that our facilities in Colorado, Iowa and Belgium have been certified by independent registrars to meet ISO 9000 Quality System Standards. Hach's Loveland, CO and Ames, IA facilities were registered by Quality Systems Registrars, Inc., to meet ISO 9001 Standards. The Namur, Belgium distribution facility was registered by the Belgian Quality Association to meet ISO 9002 Standards.

Registration is recognition that Hach Company meets the most rigorous international quality standards for product development, manufacturing and service. ISO registration underscores Hach's commitment to continuous improvement. Customers who purchase from Hach will receive products with consistent levels of performance, service and quality.

For over 45 years, Hach has taken pride in its ability to produce high quality products. According to Rex Cooper, Hach Company's Director of Corporate Quality, ISO registration reflects Hach Company's total commitment to quality and is a reaffirmation of our commitment.

"We've always defined quality as satisfying the needs and expectations of our customers," said Cooper. "ISO registration is just one way of proving that we mean what we say."

If you have any questions about Hach's quality system, products or registration, please call (800) 227-4224 in the United States or (303) 669-3050 outside of the United States, or write: Hach Company, P.O. Box 389, Loveland, CO 80539.

## IRRADIATED FOODS HERE TO STAY

Despite some misgivings in the public and scientific arena, food irradiation is here to stay, and we most likely will see an increase in the number of irradiated foods available, says a Penn State food scientist.

"Many critics of food irradiation feel that government and industry have not presented strong enough evidence that it is safe," says Manfred Kroger, professor of food science in Penn State's College of Agricultural Sciences. "They also are concerned that irradiated foods can easily become recontaminated."

"Evidence gathered by the U.S. Department of Agriculture (USDA) and the U.S. Food and Drug Administration shows that foods treated with ionizing radiation do not become radioactive. Also, irradiation does not alter the chemicals in food to make them unacceptable. There is always a chance of recontamination by foodborne pathogens, but this is minimized if food preparers are trained in safe foodhandling procedures."

Irradiated foods have been exposed to an extremely low level of radioactive material. For example, irradiated poultry receives a 1.5 to 3.0 kilogram dose of ionizing gamma rays. This treatment destroys bacteria and other microorganisms, such as *Salmonella*, *Escherichia coli*, *Listeria* and *Campylobacter*. These and other foodborne pathogens are responsible for an estimated 80 million illnesses and 9,000 deaths in the United States each year.

Because irradiation also deters spoilage, it could contribute to alleviating the world's food distribution problem, Kroger says.

In November, the World Health Organization released a statement saying that food contamination probably is the most widespread world health problem. The organization called for greater use of irradiation to destroy the organisms that spread a variety of diseases through food, and noted that irradiation could prevent some of the massive food losses due to pests, bacteria and fungi.

Food irradiation is used in more than 30 countries. Japan, for example, irradiates thousands of tons of potatoes each year to prevent sprouting. In the United States, foods have been approved for sale after irradiation since the early 1980s.

"Only one U.S. company currently is irradiating foods — mainly fruits, as well as other foods upon request," says Kroger. "When retailed, these foods carry a special label showing a logo with a plant inside a circle and the statement 'Treated by Irradiation.'"

In 1992, the USDA's Food Safety and Inspection Service approved irradiation of uncooked poultry to control *Salmonella* and other bacteria. Currently, four independently owned food retailers in the United States are selling irradiated poultry. Irradiated beef is not yet available.

"Concerns about the process are reminiscent of those expressed during the early years of milk pasteurization," says Kroger. "People were afraid that this process would cause more health problems than it prevented. But pasteurization has posed no danger to human health. On the contrary, it put an end to tuberculosis bacteria in milk, which killed millions of people worldwide."

"Irradiation is no guarantee against spoilage and foodborne illnesses," he says. "But it is an additional preventive measure, and it has the potential to save lives."

## TRI-CLOVER RECEIVES ISO 9001 CERTIFICATION

Tri-Clover, Inc., a worldwide manufacturer of process equipment for a variety of industries, has received ISO 9001 certification, an international standard of quality procedures.

The certification applies to operations at Tri-Clover's 325,000 sq. ft. manufacturing and administrative office complex in Kenosha, WI, where the company produces pumps, valve fittings and systems used widely in process industries.

Announcement that the company had received ISO certification was made by Tri-Clover President Harold Mayer, who credited the firm's entire work force for measuring up to all phases of the comprehensive international standard. He noted that Tri-Clover is among the first manufacturers of its type of products to receive the prestigious certification.

"The ISO certification enhances our reputation as a global manufacturer of quality products. This achievement takes on added importance as more and more companies look to this certification as a means of evaluating suppliers before making purchasing decisions. In fact, a number of firms are making this certification a prerequisite for its suppliers," Mayer said.

Tri-Clover representatives from throughout the company devoted approximately 1-1/2 years of preparation, planning and

training to satisfy ISO 9001 requirements. The overall effort at Tri-Clover was administered by Robert Gamble, a quality assurance coordinator at the company with nearly 20 years experience.

Gamble estimated that several thousand hours were devoted to planning and meeting ISO requirements. He noted that, from the beginning, the program received attention and full participation from company management and all employees.

"It was both a team effort and a team achievement," Gamble said.

Gamble also pointed out that receiving ISO 9001 certification does not represent the end of the program or management's commitment to it.

"It's an on-going process. We worked hard to achieve ISO 9001 certification. Now we will continue to apply our efforts toward maintaining it," he explained.

The ISO 9001 certification process ranks as the most comprehensive rating in the program outlined by the International Standards Organization. To qualify, ISO 9001 certified companies must document specific quality procedures in all phases of business operation. More than 20 separate areas, as well as their inter-relationships are evaluated. These include quality systems, design controls, purchasing procedures, product identification and traceability, process control, inspection and testing, handling, storage, packaging, training and service.

Tri-Clover's ISO 9001 certification was awarded after a thorough audit of the company's operational programs and procedures by National Quality Assurance, U.S.A., an internationally recognized registrar of companies' quality management systems for ISO 9000 series. The certifying organization has three offices in the United States, as well as affiliate offices in England, Northern Ireland, Scotland and India.

Tri-Clover is a leading manufacturer of sanitary stainless steel valves, pumps and fittings, as well as flow control, batch/ weigh and Clean-in-Place systems. Tri-Clover, Inc., an Alfa Laval Flow Company, is celebrating its 75th Anniversary this year.

## **THE EDUCATIONAL FOUNDATION OF THE NATIONAL RESTAURANT ASSOCIATION ANNOUNCES NEW OFFICERS, TRUSTEES**

The Educational Foundation of the National Restaurant Association recently elected George D. Rice, FMP, chairman and chief executive officer of GDR Enterprises, Inc., Tampa, FL, as chairman of the board of trustees for the 1994-95 term.

Rice is the founder of GDR Enterprises, Inc., formed in 1973 and specializing in marketing and information management consulting to the hospitality industry.

Before GDR Enterprises, Inc., Rice held executive positions at Dunkin' Donuts, Chicken Unlimited Enterprises and NPD Research. During his tenure at NPD Research, Rice co-founded The CREST Report, which is used by over 100 chain restaurants and foodservice manufacturers to track total restaurant consumer purchase behavior.

In addition to Rice, new officers of the Educational Foundation are:

- Vice Chairman: John R. Farquharson, FMP, Chairman, ARA, Global Food Services, Philadelphia, PA.
- Treasurer: Joseph K. Fassler, FMP, President and CEO, Restaura, Inc., Phoenix, AZ.

- Secretary Michael E. Hurst, FMP, President, 15th Street Fisheries, Fort Lauderdale, FL.

The Educational Foundation also elected four new members to the board of trustees for the 1994-1997 term:

- Donald M. Coe, President, Hiram Walker & Sons, Inc., Detroit, MI.
- Edward P. Grace III, FMP, President and CEO, Bugaboo Creek Steak House, Inc., East Providence, RI.
- Linda L. Hoops, Director of Education and Training, University of Mississippi, University, MS.
- Clark D. Jones, FMP, Chairman, JB's Restaurants, Inc., Salt Lake City, UT.

The Educational Foundation's Board of Trustees, comprised of 30 industry and academic professionals, establishes strong policies and guidelines to help the foodservice industry continue to grow and prosper worldwide. Board members, who are elected to serve 3-year terms, also work with the Foundation's management staff in the development of training products and services.

The Educational Foundation of the National Restaurant Association, a non-profit organization founded in 1987, is one of the leading sources of education and training for the foodservice industry.

## **PURINA MILLS RESEARCH FELLOWSHIP AWARDS GO TO DARIN BREMMER AND STEVEN BANTA**

Darin Bremmer, University of Illinois, and Stephen Banta, Arizona State University, have been renamed recipients of the Purina Mills Research Fellowship Awards. The awards were presented July 13th during the awards ceremony of the 89th Annual Meeting of the American Dairy Science Association, held at the Minneapolis Convention Center and hosted by the University of Minnesota.

Darin Bremmer, Master's candidate at the University of Illinois, received a B.S. degree from the University of Wisconsin-Platteville, and is currently working on his M.S. degree with Dr. Jimmy H. Clark. Bremmer's current research is concerned with the energy content of feeds given to high producing dairy cows. Once his M.S. work is completed, Bremmer plans to work toward a Ph.D. degree at the University of Illinois, specializing in dairy cattle nutrition. After completion of graduate work, he plans to begin a career as a dairy cattle nutrition consultant or to seek a position at a land-grant university.

Stephen Banta received his B.S. in 1993 from the University of Arizona and, during his undergraduate years, Banta worked for the University dairy. Now studying for his M.S. degree at Arizona, Banta is concerned with the influence of roasted, steam-flaked, dry-rolled sorghum grain on lactational performance and diet digestibilities in high producing cows. He is currently a Research Assistant working under J. Tal Huber, his advisor. After receiving his M.S. degree, Banta hopes either to pursue a Ph.D. degree or to enter law school.

Purina Mills, awards sponsor, annually awards research fellowships to outstanding graduate students engaged in animal nutrition research at a land-grant university. More than 150 fellowships have been awarded since the company began the program in 1949.



# **ATTENTION POTENTIAL AUTHORS**

## **Dairy, Food and Environmental Sanitation**

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# Federal Register

## Department of Health and Human Services

### Food and Drug Administration

21 CFR Part 173

[Docket No. 78G-0027]

#### Secondary Direct Food Additives Permitted in Food for Human Consumption; Cellulose Triacetate

**Agency:** Food and Drug Administration, HHS.

**Action:** Final rule.

**Summary:** The Food and Drug Administration (FDA) is amending its food additive regulations to provide for the safe use of cellulose triacetate as an immobilizing agent for lactase for use in reducing the lactose content of milk. This action is in response to a petition filed by Vitenco, Inc.

**Dates:** Effective July 20, 1994; written objections and requests for a hearing by August 19, 1994.

**Addresses:** Submit written objections to the Dockets Management Branch (HFA-305), Food and Drug Administration, rm. 1-23, 12420 Parklawn Dr., Rockville, MD 20857.

**For Further Information, Contact:** F. Owen Fields, Center for Food Safety and Applied Nutrition (HFS-207), Food and Drug Administration, 200 C St. S.W., Washington, DC 20204, (202) 254-9528.

**Supplementary Information:** In a notice published in the Federal Register of March 17, 1978 (43 FR 11266), FDA announced that a generally recognized as safe (GRAS) affirmation petition (GRASP 7G0088) had been filed by Vitenco, Inc., 594 Marett Rd., Lexington, MA 02173, requesting that lactase from *Kluyveromyces (Saccharomyces) lactis* entrapped in cellulose triacetate fibers be affirmed as GRAS for use in reducing the lactose content of milk. Subsequent to the filing of this petition, FDA affirmed, in response to a separate petition (GRASP 6G0077), that lactase enzyme from *K. lactis* is GRAS for this use (21 CFR 184.1388) (49 FR 47384 at 47387, December 4, 1984). Therefore, this document deals only with the use of cellulose triacetate as an immobilizing agent and with any potential contaminants that might be introduced into food from this use.

Although the information submitted in GRASP 7G0088 allows the agency to conclude that the use of cellulose triacetate as an immobilizing agent is safe, the petition did not establish that the critical data are generally available as required by 21 CFR 170.30(b). Consequently, the agency has evaluated those portions of the petition that relate to cellulose triacetate as a food additive (rather than as a GRAS affirmation) petition and is issuing this decision in accordance with 21 CFR 170.38(c)(1).

## I. Determination of Safety

Under section 409(c)(3)(A) of the Federal Food, Drug, and Cosmetic Act (the act) (21 U.S.C. 348[c][3][A]), the so-called "general safety clause," a food additive cannot be listed for a particular use unless a fair evaluation of the evidence establishes that the additive is safe for that use. FDA's food additive regulations (21 CFR 170.3[i]) define safe as "a reasonable certainty in the minds of competent scientists that the substance is not harmful under the intended conditions of use."

The Delaney anticancer provision of the general safety clause of the act (section 409[c][3][A]) further provides that no food additive shall be deemed safe if it is found to induce cancer when ingested by man or animal. Importantly, however, the Delaney clause applies to the additive itself and not to constituents of the additive. That is, where an additive itself has not been shown to cause cancer, but contains a carcinogenic impurity, the additive is properly evaluated under the general safety clause using risk assessment procedures to determine whether there is a reasonable certainty that no harm will result from the proposed use of the additive (see *Scott versus FDA*, 728 F.2d 322 [6th Cir. 1984]).

## II. Evaluation of Safety of the Petitioned Use of the Additive

The requested use of cellulose triacetate is as an immobilizing agent for the enzyme lactase in the production of reduced lactose milk. Cellulose triacetate containing physically entrapped lactase enzyme is added to milk that is to be treated; enzymatic digestion of lactose is allowed to occur, and the immobilizing agent and entrapped enzyme are then quantitatively removed from the treated milk. Data submitted by the petitioner demonstrate that when cellulose triacetate is used as an immobilizing agent, it does not affect the milk in which it is used in any way. The data in the petition also demonstrate that no detectable cellulose triacetate is present in the final product intended for human consumption. Based on these factors, FDA concludes that the ingredient itself is safe under these conditions of use.

FDA, in its evaluation of the safety of this additive, has reviewed not only the safety of the additive itself but also the safety of the chemical impurities that may be present in the additive from the manufacturing process. Residual amounts of reactants and manufacturing aids are commonly found as contaminants in chemical products, including food additives.

Methylene chloride is used as a solvent in the initial stages of manufacture of cellulose triacetate-immobilized lactase. Subsequent to the use of methylene chloride, the resultant fibers are completely dried to eliminate any remaining volatile contaminants (such as residual methylene chloride). Furthermore, before it is used in food, the product is washed several times to ensure removal of any such residual contaminants. Data submitted by the petitioner demonstrate that methylene chloride could not be detected in the final

# CALL FOR PAPERS

## IAMFES

82<sup>nd</sup> Annual Meeting July 30-August 2, 1994  
Pittsburgh, Pennsylvania

### Instructions to Prepare Abstracts

#### Procedure

- Use the printed Abstract form that appears on the other side of this page.
- Type in the title, CAPITALIZE the first letter of the first word and proper nouns.
- List the names of authors and institution(s). Capitalize first letters and initials.
- Give the name, title, mailing address and the office telephone number of the author who will present the paper.
- If the paper is to be presented by a student entered in the Developing Scientists Awards Competitions, check the box to indicate this and have the form signed by your Major Professor or Department Head.
- Check the most appropriate box to indicate the general subject area of the paper. Indicate subject if checking "other."
- Type the abstract double-spaced, in the space provided on the abstract form.

#### Mail two copies of the abstract before December 15, 1994 to:

Steven K. Halstead, CAE  
Executive Manager, IAMFES  
6200 Aurora Avenue  
Suite 200W  
Des Moines, IA 50322-2838

Enclose two stamped, self-addressed postcards. Two cards must be included with each abstract that is submitted. One will be returned to acknowledge receipt of the abstract and the other to notify the presenter of the time the paper is to be presented.

#### Content of the Abstract

The abstract should describe briefly: (a) the problem studied, (b) methods applied, (c) essential results, and (d) conclusions.

#### Presentations Format:

Papers may be presented orally or by poster format at the discretion of the Program Committee. Oral presentations will be scheduled so a speaker has a maximum of 15 minutes, including a 2-4 minute discussion. Carousel projectors for 35 mm slides will be available.

Overhead projectors are not to be used and none will be available.

#### Subject Matter for Papers

Papers should report the results of applied research on: food, dairy and environmental sanitation; foodborne pathogens; food and dairy microbiology; food and dairy engineering; food and dairy chemistry; food additives and residues; food and dairy technology; food service and food administration; quality assurance/control; mastitis; environmental health; waste management and water quality.

#### Developing Scientist Awards Competitions

The **Oral Competition** is open to GRADUATE students enrolled at accredited universities or colleges whose research deals with problems related to environmental, food and/or dairy sanitation, protection and safety. Candidates cannot have graduated more than one (1) year prior to the deadline for submitting abstracts.

This year the Oral Competition will be limited to up to ten finalists and awards will be given to the top three presenters. The papers should be approximately fifteen (15) minutes, including a 2-4 minute discussion.

The **Poster Competition** is open to UNDERGRADUATE and GRADUATE students enrolled at accredited universities or colleges whose research deals with problems related to environmental, food and/or dairy sanitation, protection and safety. Candidates cannot have graduated more than one (1) year prior to the deadline for submitting abstracts.

Up to 10 finalists will be selected for the Poster Competition. The presentation must be mounted on an 8' by 4' display board (provided at the meeting) for the entire duration of the Poster Session at the Annual Meeting. The presenter must be present at their poster for a specific time, approximately two hours during the session. (For more information on the Developing Scientist Awards Competitions, see the following green pages.)

All winners are presented and honored at the annual Awards Banquet. The finalists will receive complimentary tickets and are expected to be present at the Banquet.

#### Additional Abstract Forms

Extra copies of the abstract forms may be obtained from Steven K. Halstead, Executive Manager, or you may photocopy this one.

#### Membership in IAMFES

Membership in IAMFES is NOT a requirement for presenting a paper at the IAMFES Annual Meeting.

(OVER)

# IAMFES Abstract Form

## DEADLINE: DECEMBER 15, 1994

Title of Paper \_\_\_\_\_

Authors \_\_\_\_\_

Name and Title of Presenter \_\_\_\_\_

Institution and Address of Presenter \_\_\_\_\_

Office Phone Number (\_\_\_\_) \_\_\_\_ - \_\_\_\_\_

Developing Scientist Awards Competition  Yes  Oral  Poster

Major Professor/Department Head approval (signature and date) \_\_\_\_\_

General Subject Area	
<input type="checkbox"/> Quality Assurance/Control	<input type="checkbox"/> Food Service
<input type="checkbox"/> Food Microbiology	<input type="checkbox"/> Sanitation
<input type="checkbox"/> Dairy Microbiology	<input type="checkbox"/> Food Safety
<input type="checkbox"/> Waste Management	<input type="checkbox"/> Processing
<input type="checkbox"/> Lab Methods	<input type="checkbox"/> Epidemiology
<input type="checkbox"/> Foodborne Pathogens	<input type="checkbox"/> Other _____
<input type="checkbox"/> Chemical Residues	_____
<input type="checkbox"/> Environmental Health	_____

Check the format you prefer.	
<input type="checkbox"/> Oral	<input type="checkbox"/> Poster
<input type="checkbox"/> Video Theater	<input type="checkbox"/> No Preference

**Please TYPE abstract, DOUBLE-SPACED, in the space provided here.**

**Selected presentations, with permission, will be recorded (audio or visual).**

I authorize IAMFES to record my presentation.

Signature \_\_\_\_\_ Date: \_\_\_\_\_

I do not wish to be recorded.

Signature \_\_\_\_\_ Date: \_\_\_\_\_



**Announcement:  
Developing Scientist Awards Competitions  
(Supported by Sustaining Members)**

IAMFES is pleased to announce continued extension of its program to encourage and recognize the work of students in the field of food safety research. In addition to the Oral Developing Scientist Awards Competition, IAMFES will again offer a Poster Presentation Award Competition.

**Purpose**

1. To encourage graduate and undergraduate students to present their original research at the IAMFES meeting.
2. To foster professionalism in students through contact with peers and professional members of IAMFES.
3. To encourage participation by students in IAMFES and its annual meeting.

**Developing Scientist Oral Competition:**

The Oral Competition is open to GRADUATE students enrolled in M.S. or Ph.D. programs at accredited universities or colleges whose research deals with problems related to environmental, food and/or dairy sanitation, protection and safety. Candidates cannot have graduated more than one (1) year prior to the deadline for submitting abstracts.

This year the Oral Competition will be limited to ten (10) finalists and awards will be given to the top three (3) presenters. The papers should be approximately fifteen (15) minutes long including a two to four (2-4) minute discussion.

**Awards:** First Place: \$500 and a Plaque; Second Place: \$300 and a certificate of merit; Third Place: \$100 and a certificate of merit. All of the winners will receive a one-year membership including both *Dairy, Food and Environmental Sanitation* and the *Journal of Food Protection*.

**Developing Scientist Poster Competition:**

The Poster Competition is open to UNDERGRADUATE and GRADUATE students enrolled at accredited universities or colleges whose research deals with problems related to environmental, food and/or dairy sanitation, protection and safety. Candidates cannot have graduated more than one (1) year prior to the deadline for submitting abstracts.

Up to ten (10) finalists will be selected for the Poster Competition. The presentation must be mounted on an 8' by 4' display board (provided at the meeting) for the entire duration of the Poster Session at the Annual Meeting. The presenter must be present at his/her poster for a specific time, approximately two hours, during the session.

**Awards:** First Place: \$500 and a Plaque; Second Place: \$300 and a certificate of merit; Third Place: \$100 and a certificate of merit. All of the winners will receive a one-year membership including both *Dairy, Food and Environmental Sanitation* and the *Journal of Food Protection*.

Instructions to Developing Scientist Awards Competitions Entrants (Oral and Poster):

**\*Note:** Abstracts must be submitted to the IAMFES office no later than December 15, 1994. No forms will be sent to entrants. Enclose two self-addressed, stamped postcards with your submitted abstracts.

1. One original and four copies of an abstract of the paper must be submitted on the green abstract form found in the September or October issues of the IAMFES journals. Indicate on the abstract form whether the presentation is submitted for the Oral or Poster Competition.
2. The presentation and the student must be recommended and approved for the Competition by his/her Major Professor or Department Head, who must sign the Abstract.
3. The work must represent original research done by the student and must be presented by the student.
4. Each student may enter only one (1) paper in either the Oral or Poster Competition.
5. All students will receive confirmation of acceptance of their presentations along with guidelines for preparing their Oral or Poster Presentations.
6. All Students with accepted abstracts will receive a complimentary membership which includes their choice of *Dairy, Food and Environmental Sanitation* or the *Journal of Food Protection*.
7. Winners are announced at the Annual Awards Banquet. The finalists for the Oral Competition and the Poster Competition will receive complimentary tickets and are expected to be present at the Banquet.

## Judging Criteria for Developing Scientist Awards Competitions

### Judging

The abstracts and presentations will be evaluated by an independent panel of judges. Selection of up to ten (10) finalists for both the Oral and Poster Competitions will be based on evaluations of the abstracts and the scientific quality of the work (see judging criteria). All entrants in the Developing Scientist Awards Competitions will be advised of the judges' decisions by March 31, 1995.

Only the ten (10) finalists in each category will be judged at the Annual Meeting and will be eligible for the final awards. All other entrants who submitted papers accepted by the IAMFES Program Committee will be expected to present their papers/posters as part of the regular Annual Meeting program, but their presentations will not be judged and they will not be eligible for awards.

### Judging Criteria

#### ABSTRACT

Clarity, comprehensiveness, conciseness;

#### SCIENTIFIC QUALITY

Adequacy of experimental design;

Extent objectives were met;

Difficulty of research, depth;

Validity of conclusions based upon data;

Technical merit, contribution to science;

#### ORAL PRESENTATION or POSTER PRESENTATION

Organization: clarity of introduction, objectives, methods, results and conclusions;

Quality of visuals;

Quality and poise of presentation and in answering questions.

**\* NOTE: Your abstract must be submitted to the IAMFES office no later than December 15, 1994. No forms will be sent to entrants. Enclose two self-addressed, stamped postcards with your original abstract and four copies.**

product immediately prior to its use in food at a detection limit of 0.5 parts per million (ppm).

Nevertheless, the agency has used risk assessment procedures to estimate the upper-bound risk presented by methylene chloride, a carcinogenic chemical that may be present as an impurity in the additive. This risk evaluation has two aspects: (1) Assessment of the hypothetical worst-case exposure to the impurity from the proposed use of the additive; and (2) extrapolation of the risk observed in the animal bioassays to the conditions of hypothetical worst-case human exposure.

FDA has estimated the hypothetical worst-case exposure to methylene chloride from the proposed use to be 6.0 nanograms per person per day (ng/p/day) (Ref. 1). This estimate is based on the assumption that methylene chloride is present in the additive at its detection limit, although it was not actually detected in any of the samples tested.

Using risk assessment procedures, FDA used data from the National Toxicology Program report (Ref. 2) of a bioassay on methylene chloride to calculate the potency, or unit risk, from exposure to this chemical (Ref. 3). The results of the bioassay on methylene chloride demonstrated that the material was carcinogenic for mice under the conditions of the study. The test material induced benign and malignant neoplasms in both the liver and lung of both sexes when administered by the inhalation route.

The agency also evaluated data from a second study in mice of the same strain as used in the inhalation study. In this study, methylene chloride was administered in the drinking water of the mice (Ref. 4). In this second study, there was no significant increase in the incidence of neoplasms at any site examined. However, assuming that methylene chloride would induce neoplasia at a dose just above the highest level tested in the drinking water study, a maximum potency can be estimated. This estimate is approximately the same as the potency calculated from the data of the inhalation study, providing confidence that using the inhalation study for upper bound risk assessment is not likely to underestimate any potential risk due to ingested methylene chloride (Ref. 3).

Based on a calculated hypothetical worst-case potential exposure of 6.0 ng/p/day, FDA estimates that the upper-bound limit of individual lifetime risk from the potential exposure to methylene chloride resulting from the use of cellulose triacetate as an immobilizing agent in the production of reduced lactose milk to be  $4.4 \times 10^{-11}$ , or approximately 4 in 100 billion (Ref. 5). Because there is no evidence to suggest, or any reason to believe, that methylene chloride will be present in the final product at the assumed level, the calculated estimate of the upper-bound limit of risk is likely to be substantially higher than any actual risk. Thus, the agency concludes that there is a reasonable certainty of no harm from the exposure to methylene chloride that might result from the proposed use of cellulose triacetate as an immobilizing agent in the production of reduced lactose milk.

### III. Conclusion on Safety

Having evaluated data in the petition and other relevant material, the agency concludes that the proposed use of the food additive is safe, and that the regulations in § 173.357 (21 CFR 173.357) should be amended as set forth below.

The agency has considered whether a specification is necessary to control the amount of methylene chloride in the food additive. The agency finds that a specification is not necessary for the following reasons: (1) The steps utilized in the manufacture of cellulose triacetate that are intended to remove contaminants such as methylene chloride (drying to completion and washing of the resin to remove volatile and nonvolatile components, respectively, either of which could interfere with the intended enzymatic reaction) are a necessary part of the manufacturing process. Therefore, the agency would not expect this impurity to become a component of food at other than extremely small levels; (2) when the additive is manufactured under these conditions, methylene chloride could not be demonstrated to be present in the additive at a level of detection of 0.5 ppm; and (3) the upper-bound limit of lifetime risk from exposure to this impurity, even when calculated by using several worst case assumptions, is extremely low, less than 4.4 in 100 billion.

In accordance with § 171.1(h) (21 CFR 171.1(h)), the petition and the documents that FDA considered and relied upon in reaching its decision to approve the petition are available for inspection at the Center for Food Safety and Applied Nutrition by appointment with the information contact person listed above. As provided in 21 CFR 171.1(h), the agency will delete from the documents any materials that are not available for public disclosure before making the documents available for inspection.

### IV. Environmental Impact

The agency has carefully considered the potential environmental effects of this action and has concluded that the action will not have a significant impact on the human environment, and that an environmental impact statement is not required. The agency's finding of no significant impact and the evidence supporting that finding, contained in an environmental assessment, may be seen in the Dockets Management Branch (address above) between 9 a.m and 4 p.m., Monday through Friday.

### V. Objections

Any person who will be adversely affected by this regulation may at any time on or before August 19, 1994, file with the Dockets Management Branch (address above) written objections thereto. Each objection shall be separately numbered, and each numbered objection shall specify the particular provisions of the regulation to which objection is made and the grounds for the objection. Each numbered objection on which a hearing is requested shall specifically so state. Failure to request a hearing for any particular objection shall constitute a waiver of the right to a hearing on that objection. Each numbered objection for which a hearing is requested shall include a detailed description and analysis of the specific factual information intended to be presented in support of the objection in the event that a hearing is held. Failure to include such a description and analysis for any particular objection shall constitute a waiver of the right to a hearing on the objection. Three copies of all documents shall be submitted and shall be identified with the docket number found in brackets in the heading of this document. Any objections

received in response to the regulation may be seen in the Dockets Management Branch between 9 a.m. and 4 p.m., Monday through Friday.

#### VI. References

The following references have been placed on display in the Dockets Management Branch (address above) and may be seen by interested persons between 9 a.m. and 4 p.m., Monday through Friday.

1. Memorandum from Gregory Cramer, Regulatory Food Chemistry Branch to L. Lin. Direct Additives Branch, dated July 7, 1986.
2. "Technical Report on the Toxicology and Carcinogenesis Studies of Dichloromethane (Methylene Chloride) in F344/N Rats and B6C3F1 Mice," NTP Draft Report, NTP-TR-306, National Institute of Health Publication No. 1 85-2562. 1985.
3. Memorandum from the Quantitative Risk Assessment Committee, dated November 15, 1985.
4. National Coffee Association, "24-Month Oncogenicity Study of Methylene Chloride in Mice — Final Report," Hazelton Laboratories America, Inc., Vienna, VA, November 30, 1983.
5. Memorandum from the Quantitative Risk Assessment Committee dated October 30, 1992.

#### List of Subjects in 21 CFR Part 173 Food additives.

Therefore, under the Federal Food, Drug and Cosmetic Act and under authority delegated to the Commissioner of Food and Drugs, 21 CFR part 173 is amended as follows:

#### PART 173 — SECONDARY DIRECT FOOD ADDITIVES PERMITTED IN FOOD FOR HUMAN CONSUMPTION

1. The authority citation for 21 CFR part 173 continues to read as follows:

**Authority:** Secs. 201, 402, 409 of the Federal Food, Drug and Cosmetic Act (21 U.S.C. 321, 342, 348).

2. Section 173.357 is amended in the table in paragraph (a)(2) by alphabetically adding a new entry under the headings "Substances" and "Limitations" to read as follows:

§173.357 Materials used as fixing agents in the immobilization of enzyme preparations.

\* \* \* \* \*

(a) \* \* \*

(2) \* \* \*

**Substances:**  
Cellulose triacetate

**Limitations:**  
May be used as a fixing material in the immobilization of lactase for use in reducing the lactose content of milk.

Dated: July 13, 1994.

Michael R. Taylor, Deputy Commissioner for Policy.  
[FR Doc. 94-17577 Filed 7-19-94; 8:45 am]



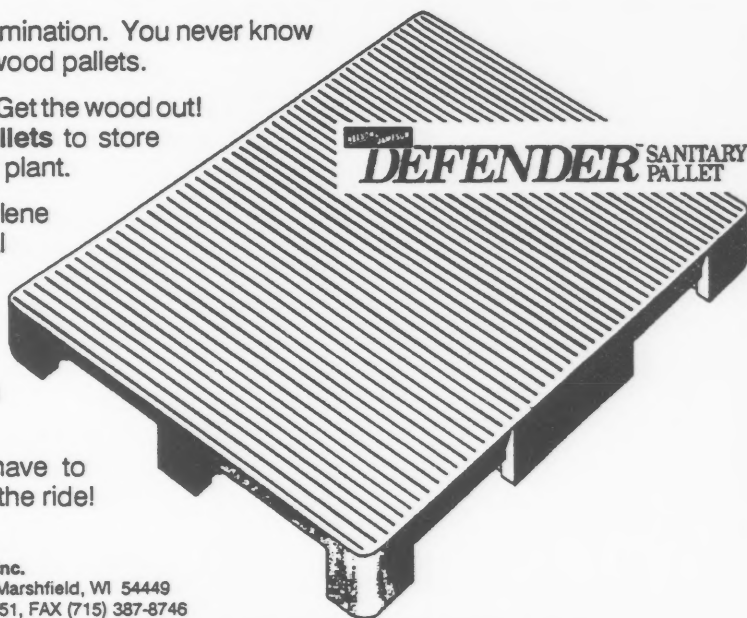
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## Updates . . .

### IAMFES Secretary Nominations Due for 1995 Election

Nominations are now being taken for Secretary for IAMFES. This year an Academia representative will be elected.

Once all nominations are received by the nominating committee, two persons will be chosen to run for the office. This is a five-year term, moving up yearly until he or she is President of IAMFES, then serving one year after as Past President. The term of office begins the last day of the 1995 Annual Meeting. All IAMFES Executive Board Members meet at least three times a year.

The two people selected are placed on a ballot. The winner is determined by a majority vote of the membership through a mail vote in the spring of 1995.

Please send a biographical sketch and photograph **NOLATER THAN NOVEMBER 1, 1994** to the Nominations Chairperson:

F. F. Busta  
Dept. of Food Science  
University of Minnesota  
1334 Eckles Ave.  
St. Paul, MN 55108  
(612) 624-3086

### Call for Papers for the 82nd IAMFES Annual Meeting

Hilton Hotel & Towers  
Pittsburgh, Pennsylvania  
July 30 - August 2, 1995

This is an invitation to all IAMFES members to submit a paper for presentation at the 82nd IAMFES Annual Meeting, to be held at the Hilton Hotel & Towers, Pittsburgh, PA, July 30 - August 2, 1994. Abstract forms are published on pages 541 - 544 of this issue of *Dairy, Food and Environmental Sanitation*.

To receive more information on submitting a paper for presentation at the 82nd IAMFES Annual Meeting, contact IAMFES at (800) 369-6337 or (515) 276-3344, or write to IAMFES, 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322.

**Deadline for Submission of Abstracts:  
DECEMBER 15, 1994**



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## Meter Measures Lead in Make-Up Water

**P**alintest's SA-1000 Scanning Analyzer is a portable, battery-powered instrument for precise measurement of lead contamination in beverage make-up water. Measurement range is 5-100 ppb and accuracy is equivalent to laboratory analytical techniques. Using disposable, pre-calibrated electrodes, costing a few dollars, each test takes 3 min. Readouts are displayed on an LCD and up to



300 test results with time, date and reference code can be stored for later downloading to a PC or output via a printer. Copper can also be measured simultaneously in the 70-2,000 ppb range.

## High Pressure Hollow Fiber Ultrafiltration Cartridges Withstand Up to 50 PSIG Transmembrane Pressure

**A** new series of hollow fiber ultrafiltration (UF) cartridges from A/G Technology is designed to withstand transmembrane pressures up to 50 psig at ambient temperatures. The Xpress™ cartridge series provides substantial economic benefits over plate and frame type systems for concentration/diafiltration of solubilized proteins and other dissolved macromolecules along with the flexibility, compact design and ease of cleaning inherent in the hollow fiber configuration. Moreover, the allowable transmembrane pressures of the Xpress™ series are **twice the transmembrane pressures of conventional hollow fibers.**

Xpress™ cartridges are available in the full range of A/G Technology nominal molecular weight cutoffs from 3,000 to 500,000 with fiber internal diameters of 0.5 and 1 mm.

A/G Technology hollow fiber membrane cartridges offer significant advantages over conventional hollow fibers as well as competitive geometries. The high intrinsic strength afforded by their macrovoid-free support structure provides for consistent, reliable performance over the lifetime of the cartridge. This unique structure also resists pore collapse at elevated temperatures which is typical of conventional UF membrane structures.

## Difco Introduces New and Improved Bacto® Sterility Test Bottles with Screw Caps

**P**ackaging enhancements for prepared wide mouth sterility test bottles from Difco Laboratories have brought a new level of convenience and accuracy to sterility testing. Bacto® Sterility Test Bottles with screw caps now feature a cap-mounted "pop-up" safety button that indicates when a bottle has experienced loss of vacuum. Bottles with both Tryptic Soy Broth (TSB; Soybean Casein Digest) and Fluid Thioglycollate Medium (FTM) containing 100 ml are available. Bottles with vacuum prevent the problems associated with the formation of a wide pink band due to oxidation of resazurin in FTM which may result in the need for boiling prior to use.

Difco's design modification of its Bacto® Sterility Bottles brings a range of benefits to users of prepared sterility testing products, including pharmaceutical labs, sterile products and medical device manufacturers, biotechnology labs, and manufacturers of parenteral solutions.

Difco has also expanded the screw cap diameter of its sterility test bottles to 48 mm, enabling easy insertion of filters and sterile devices during manual filter and sterility testing.

Bacto® sterility bottles feature color-coded labels that simplify differentiation of the media. Labels are made of laminated acetate that resists alcohol, chlorine or hydrogen peroxide treatment in preparation for clean-room use. In addition, the labels are clear, making it easier to inspect bottle contents. Each bottle also features a shrink band which provides full tamper evidence and protection from particulate matter.

A reliable and economical alternative to dehydrated media, Difco's TSB and FTM in prepared Bacto® Sterility Test Bottles provide consistent quality for sterility testing. Difco media are engineered to meet strict assay standards and conform with United States Pharmacopoeia (USP) requirements for sterility test procedures (Section 71 USP XXII). The USP requires Soybean Casein Digest Medium (TSB) for aerobic testing, and FTM for anaerobic testing. In addition, each package includes a certificate of analysis to simplify documentation. The complete line also includes diluting and rinsing solutions, Fluid A and Fluid D in septum closure bottles.

Bacto® Sterility Test Bottles are available from a national network of distributors who sell Difco's full line of products. Difco Laboratories has been a technological leader in the development and manufacture of microbiology products for nearly 100 years. For more information, write to Difco Laboratories, P.O. Box 31058, Detroit, MI 48232-7058; call Difco toll free in North America at (800) 521-0851; or send a fax to (313) 462-8517.

## Tamper-Evident Heat-Shrink Band Safeguards Beverages

**C**lear, colored and printed heat-shrink sleeves from Pro-Tek provide tamper-evident protection to bottled water, juices, iced tea, sport beverages and wine coolers.

The lay-flat rollstock banding material features accurate, consistent tolerances, and can be formulated



to meet the precision specifications required by high speed automated T-E labeling and banding equipment.

Pro-Tek rollstock is available in a wide variety of standard sizes and widths. Standard or custom graphic

printing is also available to permit the bottler to promote brand name awareness with extra visibility.

Prototype development services are available upon request. Customized inventory programs are also available to meet J-I-T demands.

For more information, contact George Albrecht, Pro-Tek Packaging Group, Inc., 73 Oser Ave., Hauppauge, NY 11788; (516) 436-7900.

## Dry Block Thermocouple and RTD Calibrator

**N**EWPORT Electronics announces the new hot point® (Model CL900) calibrator which allows calibration of thermocouple and RTD probes quickly and easily, with accuracy of 1.5°F (0.9°C). An integral RTD sensor assures high measurement accuracy and repeatability, and the microprocessor-based PID digital controller assures exceptional stability and ease of use.

The hot point® controller's dual display indicates the set and actual temperatures simultaneously. The 6-in. (153 mm) deep test well accepts inserts to size the well for the best thermal contact with the test probe. Insert blocks are available in diameters from 1/8 to 3/8 in. or undrilled.

The CL900 can be set in one-degree increments, from 40°F (22°C) above ambient to 900°F (482°C). Featuring solid-state relays for fast response, the unique



design allows users to change temperatures quickly, with minimal time lag to switch between temperatures. The unique internal fan arrangement assures fast cool-down. This also helps keep the calibrator cool to the touch.

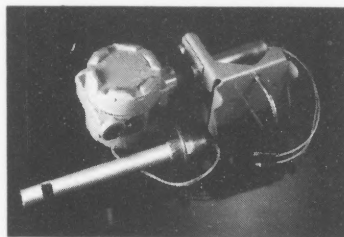
The hot point® calibrator comes complete with insert block tongs, CL906 insert (1/4 in. dia. x 6 in. test well) and operator's manual. Delivery is off-the-shelf directly from NEWPORT or through a large network of worldwide distributors. For more information, call NEWPORT Electronics Marketing at (800) NEWPORT.

## Approved Remote Mount Liquid Sensing System

**T**he Sapphire™ liquid level sensing system from Kay-Ray/Sensall is now available in a remotely mounted system that allows the electronics to be installed up to 25 ft. from the sensor in increments of 5 ft. The remote electronics features extended cables and connectors that simplify installation and allow greater accessibility of the electronics.

The Sapphire™ Liquid Level Sensing System features the patented TIME GATE™ technology for its liquid sensing and continuous self-test of the sensor and electronics, ensuring reliable level control and spill prevention across the broadest possible range of process liquids. The continuous self-test is performed automatically under both wet and dry conditions, verifying the physical integrity of the sensor including the crystal bond to the sensor body. Sapphire combines a dual compartment NEMA 4X enclosure with FM and CSA approvals, providing safe installation in hazardous locations.

Kay-Ray/Sensall, Inc., headquartered in Mount Prospect, IL, provides high precision ultrasonic, gamma and neutron process measurement instrumentation. As a member of the Fisher-Rosemount group, Kay-Ray/Sensall is a part of the largest process instrumentation provider in the world, servicing the process industries with measurement, analytical and distributed control systems for better process management.



## "23"-Series Isolator: Solving Fluid Pressure Measurement Problems

**W**hat is a Pressure Isolator? The Viatran Isolator is a tubular remote seal. Process fluid pressure displaces the interior liner and is hydraulically transferred to a pressure



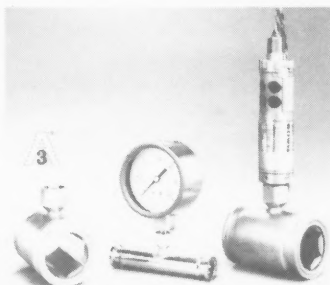
transmitter, dial gage or pressure switch. The stainless steel liner and fill fluid separate the process media from the sensing element and provide a flush surface.

#### Why Use One?

The simple design coupled with high quality stainless steel makes the Isolator an ideal solution for fluid pressure measurement in pipe applications. The Isolator's internal construction is smooth, **eliminating the dead ends, recesses and protrusions**. The fill fluid allows the Isolator to measure high temperature process fluids, up to 600°F, by separating the transmitter from the media. Viatran's Isolator is especially suited to pharmaceutical and food processing applications that require steam sterilization (SIP) and clean in place (CIP) capabilities. In other process industries, the stainless steelliner protects the sensing element from corrosive or abrasive materials.

The Isolator can be used with a pressure transmitter, digital indicator, pressure switch or dial gage. These options, coupled with **size flexibility, component compatibility, in-stock support and Viatran quality**, insure the Isolator's ability to fit the most demanding applications.

For more information, contact Viatran at (800) 688-0030.



### New Fully Programmable Circular Chart from ABB Kent-Taylor Incorporates Multiple No-Cost Extras Into Standard Design

**F**ully programmable, feature-rich COMMANDER 1900 Series Circular Chart Controller/Recorders are now available from ABB Kent-Taylor, the company has announced.

COMMANDER 1900 Controller/Recorders build upon the operational and performance advantages of the FULSCOPE 1900 ER/C, the instrument the COMMANDER 1900 Series is designed to replace.

"Dollar for dollar, the COMMANDER 1900 Series includes up to \$800 in standard features that customers would pay extra for in competitive units," said Steve Frate, marketing manager, ABB Kent-Taylor Control & Recording.

Standard features include NEMA 4X protection, 0.1% input and output accuracy, re-transmission, up to four pens and two controllers, transmitter power supply, one alarm relay, fully isolated I/O and two digital inputs per channel.

In addition, removable terminal blocks are located directly above the wiring knockouts to simplify installation. In the tradition of the FULSCOPE 1900 ER/C, displays are mounted on the outside of the door for easy access and viewing. Furthermore, the COMMANDER 1900 Series has been enhanced to permit the continuous display of all four process variables at once.

COMMANDER 1900 Controller/Recorders remain the only instruments of their kind that offer configuration and control functionality accessible from the front panel. Clearly labeled tactile keypads permit operator intervention without the need to open the unit's front door. At the same time, password protection prevents unauthorized changes to configuration and control schemes.

Notable product enhancements include optional four-channel totalization, as well as new user-configurable math functions for mass flow calculations, averaging and RH tables. Advanced logic capability permits the integration of discrete and continuous functions to solve a wide range of process problems.

The COMMANDER 1900 Series also incorporates two real-time event timers for operating relays, starting/stopping the chart or triggering other actions within the instrument.

Up to five I/Ps and P/Is per unit help make the COMMANDER 1900 Series an ideal retrofit for pneumatic instruments.

An available MODBUS RS485 serial communications link to PCs or PLCs enables the COMMANDER 1900 Series to serve as the front end of plantwide data acquisition systems.

Additional optional features include: 20 profile 99 segment ramp/soak profile; up to 12 relay outputs; up to 24 digital inputs or outputs; 24 Vac power supply; and remote setpoint.

In pharmaceutical applications, ramp/soak and totalization capabilities help make the instrument well suited for batching or temperature control, while MODBUS communications permit universal networking to a PC-based supervisory system.

The ability to add pens and other options in the field also make the COMMANDER 1900 Series ideal for OEM applications.

### New Rapid Test from Unipath Speeds Up Detection of *Listeria*

**L**aunched this month by Unipath Ltd., the Oxoid *Listeria* Rapid test enables food manufacturers to detect the presence of *Listeria* organisms in their products or processing equipment in less than half the time taken by traditional methods.

This new test combines Unipath's skills in the development of enrichment media with the company's immunological expertise. It is based on patented monoclonal antibody technology, and makes use of Unipath's

Clearview Test Unit which is being applied to food testing for the very first time.

Extensive evaluation of the test has been carried out on more than 1,000 different samples representing a wide variety of foods. This has shown the accuracy of the test to be greater than 99%.

The test protocol has been developed to coincide conveniently with the normal working hours of the laboratory, providing a clear result 2 days after the sample has been received.

The test itself is simple to perform and can be used both on food samples and environmental swabs. There is no need to batch, and no reagent mixing or washing stages are involved. This is in sharp contrast to labor-intensive ELISA-based test and traditional culture methods which usually take between 4 and 7 days to produce a result.

The culture procedure involves two enrichment stages using Oxoid Half Fraser Broth and Buffered *Listeria* Enrichment Broth which have been selected for optimal recovery and growth of *Listeria* organisms. Each stage requires a 21-h incubation period at 30°C.

A new Half Fraser Supplement, developed by Unipath, is included in the test kit for use with Fraser Broth.

After enrichment, the sample is heated at 80°C to release *Listeria* flagella antigen. The sample is then cooled, and a quantity of 135 µl is added to a Clearview Test Unit. This provides a clearly visible result within 20 min.

The Test Unit consists of a membrane strip, along which the sample travels by means of capillary action. The strip is contained within a plastic sleeve which has three 'windows': one for the addition of the sample, one to display the test result, and one which displays a control feature.

A line of antibody specific to *Listeria* flagella antigen is deposited on the membrane strip. A second antibody, which pairs with the first, is bound to blue latex particles which run up the strip in the presence of the test sample. If antigen is present, it forms a sandwich with the antibody-bound latex particles and the immobilized antibody on the strip, causing a blue line to develop in the test result window. In the absence of antigen, the latex does not localize and no line is visible.

Excess latex binds to a line of non-specific antibodies beneath the control window. This causes a blue control line to develop, indicating that the test has worked correctly. No further manipulation of the Test Unit is required.

Each Oxoid *Listeria* Rapid Test pack contains sufficient Test Units, Half Fraser Supplement and Positive Clearview control for 50 tests. Fully compatible Oxoid Fraser Broth and Buffered *Listeria* Enrichment Broth are available separately from Unipath. No additional equipment is required other than an incubator,

water bath and glass test tubes which are commonly available in any laboratory.

## Latest Innovation in Hand Sanitation

World Dryer introduces the latest innovation in hand sanitation — the Paper Towel Wash Station. Featuring the same "logic system" employed by World's traditional Wash Station. The Paper Towel Unit has sensors that provide a complete soap and water wash, activating water only after soap has been applied, and preventing a "water only" wash. Once hands are rinsed, operators simply tear a paper towel from the easy access dispenser designed into the Wash Station. Touchless features ensure sanitary cleansing with low risk of recontamination.

Additional features on the Paper Towel Wash Station include a low-soap indicator light, an on-off switch for cleaning the fixture without triggering the sensors, a water over-ride, and a "no use" warning light. The warning light alerts management if the wash station has not been used for over an hour.

The compact size of this unit enables it to fit into the same area required by dedicated hand sinks. It can be installed using existing water and electrical lines. Handwashing requirements posted right on the machine guide employees through the simple step-by-step process.

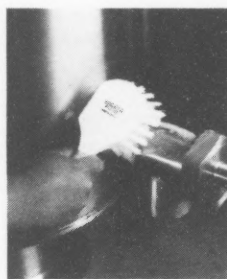
## Sparta Introduces Heavy Duty "Hercules" Hand Scrub

Sparta Brush Company has introduced the 45S-HD, heavy duty "Hercules" hand scrub with all the quality features of the favorite "Hercules" 45S, plus more.

Along with the soak-proofed design and pistol grip handle, Sparta has added extra heavy gauge nylon bristles for extra toughness. The Heavy Duty "Hercules" maintains the quality of a chip and crack-proof resilient block to lock out deadly bacteria. This hand scrub is 8 in. long with a 1 ¼ in. bristle trim.

Sparta Brush Company is a leading manufacturer of high quality specialized brushes for the foodservice and food processing industry.

For more information on the Heavy Duty "Hercules" Hand Scrub and other specialized brushes, call or write: Jim Dunn, Executive Vice President of Sales and Marketing, Sparta Brush Company, P.O. Box 317, Sparta, WI 54656-0317; (800) 356-8366.



## Lechler, Inc.'s New Catalog Now Available

Lechler, Inc. has just published a new expanded catalog and engineering manual of spray nozzles, systems and accessories. New items include a round Whisper Blast™ nozzle, hand-held Whisper Blast™ gun, additional tank washing nozzles, and Mini Selectospray® — a differential roll cooling system for the primary metals industry.

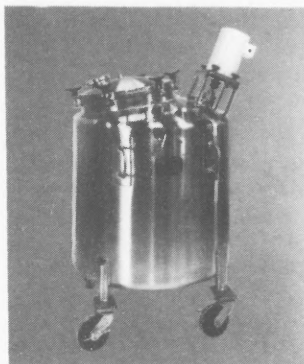
A worldwide leader in spray technology since 1879, Lechler offers...

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For your free copy of the catalog, contact Lechler, Inc. at 1-800-777-2926 or 445 Kautz Road, St. Charles, IL 60174.

## Autoclavable Mixing Tank

Sterilization is a major concern in the pharmaceutical industry, especially when it comes to injectable drugs. Lee Industries, Inc., in cooperation with its customers,



has developed a special portable tank to meet the stringent criteria set forth by the Food and Drug Administration. The vessel is portable and can be easily sterilized by removing the tri-clamp mounted motor, and placed into an autoclave. In addition to the special removable motor, the inside and outside are finished to

surface roughnesses of 6-12 Ra with the interior being electropolished.

Another advantage to the removable motor design is that operating stations can be set up to service a number of these vessels while using the same motor.

Lee engineers can design and fabricate an economical vessel that will meet your specific needs.

For more information, please contact Process Systems & Equipment, Division of Lee Industries, Philipsburg, PA 16866; phone (814) 342-0470; FAX (814) 342-5660.

## The Old Guard Gets Better

Newly designed SERFILCO Guardian Filtration Systems are engineered to provide efficient, economical removal of foreign solids and organic impurities from a wide range of chemical and electroplating solutions. Choice of pump style, filter chamber style and several optional features can be combined to offer a complete package system.

Quality improvements include stainless steel brackets, FRP cover plate and FRP mounting base to provide greater protection against atmospheric corrosion. Filter chamber, either PVC or CPVC, may be furnished with cartridges, sleeves, discs or bag, depending upon application. Solids loading capability of largest model is an equivalent 420 sq. ft. of filtering surface area.

Manufacturer states pump assembly can be seal-less magnetic drive (illustrated), single or double mechanical seal or self-priming, with flow rates to 9,000 GPH. Flow control valve is a standard feature and convenient for holding pump prime when changing filter media.

Carbon purification chamber, slurry/priming tank, wheel with push/pull handle and motor starter are popular options.

Additional information is available from SERFILCO, Ltd., 1777 Shermer Road, Northbrook, IL 60062.

## FDA-Approved Liners and Covers for Storing and Transporting Food Stuffs

A line of polyethylene drum liners, dust covers, and cover sheets for food processors, confectioners and bakers is being introduced by New England Plastics Corp. of Woburn, MA.

NEP Food Grade Drum Liners, Dust Covers and Cover Sheets are made from low density FDA-approved polyethylene. The seamless drum liners feature a contoured lip that fits snugly around the tops of drums; the dust cover sheets provide temporary in-plant protection.

Offered in straight sided and corrugated styles, NEP Food Grade Drum Liners are available in 15- and 18-mil wall thicknesses to fit 55- and 30-gallon drums. Made from 4-mil polyethylene, the dust covers come in both drum sizes and the versatile cover sheets measure 30 in. x 30 in. for use with virtually any container.



NEP Food Grade Drum Liners, Dust Covers and Cover Sheets are priced according to style and quantity. Literature and a price list are available upon request.

For more information, contact: New England Plastics Corp., Michael P. Famiglietti, Marketing, 310 Salem St., Woburn, MA, 01801; phone (617) 933-6004; FAX (617) 933-2726.

### **Drew Industrial Division of Ashland Chemical Company Announces Patent for Improved Corrosion Inhibitor System**

**A**shland Chemical Company's Drew Industrial Division was recently issued United States Patent No. 5,300,247 for an improved corrosion inhibitor system for intermediate heat transfer media such as calcium chloride brine systems. The inventors are Drew employees Dwight Emerich and Kathleen Fix.

Historically, corrosion inhibitors for intermediate heat transfer media have been based upon the use of chromate salts, phosphates, nitrites and the maintenance of a high pH. Chromate salts are being eliminated as a result of toxic effects to the environment and other corrosion inhibitors are of limited success, particularly when used in a calcium chloride brine system. In addition, problems associated with these corrosion inhibitors include sludge formation, promotion of pitting, and ineffective protection of metal surfaces. The Drew invention, PERFORMAX® 345 corrosion inhibitor, is an improved corrosion inhibitor system that provides complete corrosion control.

Ashland Chemical Company's Drew Industrial Division is a major supplier of specialty products and services for the industrial water, wastewater treatment, pulp and paper, mining, and paint and coatings markets.

For more information on PERFORMAX 345 corrosion inhibitor, contact Marketing Services, Drew Industrial Division, One Drew Plaza, Boonton, NJ 07005; phone (800) 526-1015, extension 7800, or (201) 263-7800; FAX (201) 263-4483.

### **Improved Design Sump Pump**

**S**ERFILCO's Series 'EH' chemical/plating, OEM plastic vertical pump has been redesigned, utilizing state-of-the-art injection molding of all its components, to offer even more versatility and higher performance.

This new model is available constructed of CPVC, polypropylene or PVDF for handling a wider range of chemical solutions at temperatures up to 280°F. Flow rates have been increased to 185 U.S. GPM.

Their new design also features a cantilevered, sleeved stainless steel shaft with vapor seal between the rotating shaft and support column to further protect the

chemical duty motor and atmosphere from corrosive vapors.

The cantilevered shaft also eliminates bearings and conventional seals, resulting in a pump that can run dry indefinitely. A compound impeller prevents liquid from rising in the column, even at maximum pressure, while the fully enclosed bottom impeller provides high hydraulic efficiency at low horsepower.

Additional information and pricing available from SERFILCO, Ltd., 1777 Shermer Road, Northbrook, IL 60062-5360.

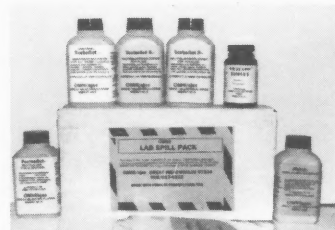
### **OMNI Lab Spill Kit for ALL Liquid Spills Encountered**

**T**he OMNI Lab Pack Spill Kit contains every type of spill clean-up product for ALL liquid spills encountered in industrial, commercial and medical laboratories.

The kit contains 16 oz. (fluid) shaker top jugs of:

- UNIVERSAL SorbaSet Absorbent/Solidifier. Absorbs and solidifies ALL liquids. DECISION-FREE SPILL CLEAN-UP. Perfect for unknown spills.
- SorbaSet S Neutralizing/Solidifier for all water-based acids (including HF) that renders these acids into easily handled solids. **MOST ACIDS ARE NO LONGER HAZARDOUS!**
- SorbaSet B Neutralizing Solidifier for all water-based alkalies. After treatment, caustics are easily handled solids. **MOST CAUSTICS ARE NO LONGER HAZARDOUS!**
- FormaSet powder turns formaldehyde and other water soluble aldehydes into an inert non-hazardous form.
- BioSet Disinfectant/Solidifier for body fluids and cyanides. Effective against the H.I.V. virus and herpes. Most cyanides are turned to cyanates.
- A 700 g bottle of MERCURY MAGNET powder that turns liquid mercury into a solid amalgam. Eliminates mercury vapor. Can be picked up using a common magnet. Ready to be recycled.
- A 30-sheet pack of OMNI VAPOR BARRIER sheets (10 in. x 12 in.). Perfect for controlling vapor forming spills before and during clean-up.

For more information, contact OMNI/AJAX, P.O. Box 161 Great Meadows, NJ 07838; phone (908) 637-4315 or (800) 891-OMNI (6664); FAX (908) 637-8455.





## The Isomatic Flow Diverter Features Automatic Switching On-Stream with Minimal Pressure Drop Through the Valve

The Isomatic Series 29 flow diverter valve is designed for operating pressures to 75 PSI in pneumatic conveying operations that require efficient on-stream switching the flow of powdery or granular materials. A main line conveying stream can be switched into one or two individual lines or vice versa, while the system continues to operate.

A simple piston operation actuated by air through a four-way valve and limit switch diverts the material flow. The performance of the Series 29 is leak-free, trouble-free with a minimum of wear. Convenient mounting pads permit installation in any position with field attached hanger brackets.

Other construction features are: An exclusive port and cushion design, stainless contact surfaces, an aluminum alloy corrosion resistant piston, pressure actuated-wear compensating, leak-free seals, rugged construction with smooth interior product contact surfaces, plus a wide range of sizes and options.

All information, specifications and dimensions are contained in bulletin GL-705, available from the Isomatic Company.

## New Portable 10-Bit Data Loggers

Science/Electronics has just introduced the 1000 Series Squirrel Data Loggers, the newest addition to an extensive line of loggers. These 10-bit battery operated units feature a two-line LCD which supports real-time data monitoring in engineering units. Small size (7 x 5 x 2.5 in.) and lightweight (2.2 lbs.) provide easy portability.

The 1000 Series loggers offer eight inputs to measure temperature from thermocouples and thermistors, and general purpose analog inputs to accept signals from a wide variety of transducers. In addition, each 1000 Series Squirrel has a pulse count channel and an eight-bit digital channel allowing eight event inputs. Each data logger will store up to 65,000 time and date stamped readings to accommodate most logging applications. The 1000 Series are designed to allow for inputs of differing ranges and types. Multi-run capability, delayed time-based logging, and logging on event provide for maximum user flexibility.

Data analysis from the ten-bit 1000 Squirrels is straightforward using existing Squirrel software, the new Taskwise and SQREM software programs. These programs support graphing and statistical analysis for fast and efficient data reduction. Real-time data collection and monitoring via modem communication is available to sustain operating in remote conditions.

For further information on the 1000 Series Squirrels or other Science/Electronics data acquisition products, write or call: Science/Electronics, P.O. Box 986, Dayton, OH 45401; phone (800) 543-9930 to (513) 859-5555; FAX (513) 859-7930.

## Tissumite™ Hand-Held Homogenizer

Tekmar now offers a homogenizing solution to people looking for a hand-held unit capable of working with volumes as small as 0.1 ml. The new Tissumite™ homogenizer features a powerful, 100 watt motor with a built-in speed controller having a range of 5,000 to 25,000 rpm. Two high shear homogenizing probes are available covering volumes of 0.1 to

50 ml. The smaller probe is only 5 mm in diameter meaning it can be used in microcentrifuge tubes. The probes can be quickly disassembled for autoclaving and maintenance, and are easily interchanged to the motor. Materials of construction are 316 stainless steel with PTFE bearings. The Tissumite™ motor weighs only 14 ounces, making



it easy to use by hand without fatigue. An optional base for stand mounting is available. For information, contact Tekmar at (800) 543-4461, P.O. Box 429576, Cincinnati, OH 45242-9576, FAX (513) 247-7050.

## New Analyzer from Drew Industrial Aids in Meeting Lead and Copper Rule Requirements

Ashland Chemical Company's Drew Industrial Division recently introduced its new ONGUARD® correlator analyzer. The device assists in performing corrosion control optimization studies and, if needed, can be used as a tool for ongoing program management.

The ONGUARD® correlator analyzer continuously monitors and records pH, lead and copper corrosion rates, oxidation reduction potential (ORP) and system fouling. Chemical treatment alternatives can be screened and optimized without interrupting normal plant operation. Data collected can be compiled and graphed for use in selecting an optimum corrosion control program to meet lead and copper rule requirements. As a dedicated unit, the ONGUARD correlator analyzer monitors program performance.

For more information, contact Marketing Services, Drew Industrial Division, One Drew Plaza, Boonton, NJ 07005; phone (800) 526-1015, ext. 7800 or (201) 263-7800; FAX (201) 263-4483.

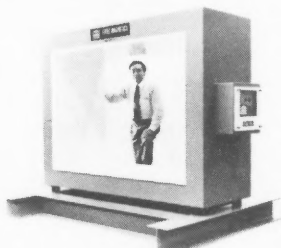
## Erlez Introduces Largest E-Z Tec® III Metal Detector

A 66-in. wide by 45-in. high E-Z Tec® III metal detector has been introduced by Eriez Magnetics. The new unit — the largest metal detector ever built by Eriez — will be used primarily in the pulp and paper industry to scan logs for the presence of metal.

E-Z Tec® III metal detectors are extremely sensitive instruments for detecting ferrous and non-ferrous metals in liquid, powder, granular, bulk, solid or packaged materials. Models are available to handle most any application. They are used in industries such as food, chemical, cosmetics, pharmaceuticals, rubber, plastics, wood products, textiles — wherever metal contamination in products is a concern.

Eriez Magnetics designs, develops, manufactures and markets advanced technology equipment for magnetic separation, vibratory applications, metal detection and materials conveying and controlling applications throughout the world.

For more information on E-Z Tec III metal detectors, write: Eriez Magnetics, Asbury Road at Airport, P.O. Box 10608, Erie, PA 16514-0608, or call toll free (800) 345-4946. For international inquiries, FAX: (814) 833-3348.



## Now, Cook and Cool with Superior Agitation

Only one vessel is designed with a Uniflow coil jacket on both the bottom head and sidewall and with full scraped-surface, double-motion, counter-rotating agitation. This vessel is the Cook/Cool Tank from Lee Industries, Inc.

The pattern of Lee's unique Uniflow jacketed coils eliminates hot spots and provides uniform thermal flow over the interior surface of the vessel. The geometric strength of this coil offers years of trouble-free operation at the heating and cooling extremes needed in various processing applications.

Efficient temperature transfer is only 50% of an optimum processing operation in a cook/cool vessel. Lee's Cook/Cool Tank can be equipped with any agitation system. However, our model No. 9M double-motion agitator can provide mixing efficiency that you didn't think existed. The USDA approved scraper blades and bottom support bushing, unique offset frame construction, fully enclosed gearbox, and the choice of fixed or variable speed operation offer versatility under sanitary conditions not found in other cook/cool vessels.

As with all Lee equipment, these vessels can be custom designed to meet your specific requirements. For additional information, please contact Process Systems and Equipment,

Division of Lee Industries, Inc., P.O. Box 687, Philipsburg, PA 16866; FAX (814) 342-5660; phone (814) 342-0470.

## Carbon Dioxide Recorder

Markson Science, Inc., introduces a new Carbon Dioxide Recorder that measures, records and continuously monitors carbon dioxide levels. This multi-application recorder is portable, lightweight and easy to use and features an advanced remote non-dispersive infrared sensor, which effectively monitors indoor air quality or anaerobic environments. Its digital readout and recorder both have two user-selectable ranges; to 1,100 ppm or 0 to 2,200 ppm. Air composition, ventilation, temperature and humidity are essential parameters for microbial growth. Anaerobic chambers, contained production areas, clean rooms and laboratory environments will all benefit using this new technology. For more information about this important advance in sensor technology, call (800) 528-5114.

## Practical pH Information Booklet: Practical Information to Get the Best Results in pH Measurement

Created specifically for the researcher and student using pH measurement in their scientific application, this booklet is full of useful information on electrode selection and tips on cleaning care, plus a complete, easy to read troubleshooting guide. The guidebook presents pH in a basic and straightforward manner to help the students understand pH measurement and the seasoned veteran refresh his skills. The *Practical pH Booklet* is the perfect piece of literature to answer all your pH questions. With the aid of this text, both the student and instructor will find their pH measurements even more accurate and precise. Handy and informative, this new booklet is the perfect reference guide for any lab measuring pH.

For more information, contact Emily S. Moser, (503) 648-0762; FAX (503) 648-8118.

## Applied Research Institute Makes Announcement

Applied Research Institute, Inc., announced that it has made arrangements to have manufactured several hard-to-find tablets for reduction methods.

Methylene Blue Tablets and Resazurin Tablets are both available in 100 tablet bottles.

The tablets are used in dye reduction tests which indirectly estimate numbers of bacteria in milk in terms of the time required, after starting incubation, for the color of a dye-milk mixture to change.

Applied Research Institute has served the Food and Dairy Industry Testing industries for over 40 years with testing methods, apparatus and chemical reagents.

Further information can be obtained from Applied Research Institute, 141 Lewis Street, Perth Amboy, NJ 08861; phone (908) 442-1888; FAX (908) 442-1688.

## New Packaging for Dehydrated Culture Media

**B**ecton Dickinson Microbiology Systems, Cockeysville, MD, announces the immediate availability of a new 500 g bottle for BBL® Dehydrated Culture Media. The new 500 g bottle size incorporates many unique packaging features, including built-in handles, wide mouth, rust-proof plastic lid with tamper-evident induction seal, multilingual language labeling and detachable Quality Control Certificate of Analysis.

In designing the new 500 g bottle, Becton Dickinson Microbiology Systems considered the packaging needs of numerous laboratories worldwide, including protocols for quality control certificates, environmental concerns, convenience, ease of use and more.

Every new bottle includes a key feature requested by laboratorians: a separate Quality Control Certificate of Analysis, including technical product information that documents the quality control organisms used to test the media. The certificate is affixed to the outside of the bottle and peels off for easy insertion into a use file.

For added convenience, the new bottles are compact, easy to store, and recyclable (due to their polyethylene construction). Plastic lids ensure elimination of rust even in extremely humid conditions, while the tamper-evident induction seal ensures that no contaminants have been introduced. In addition, the wide mouth allows easy access for scooping, while built-in handles facilitate dispensing of the powder. To help the laboratorian maintain proper product inventories, HIBC primary and secondary bar codes are included on each 500 g bottle.

Laboratorians are urged to contact their local distributor to receive the new BBL Dehydrated Culture Media 500 g bottle from Becton Dickinson Microbiology Systems.

## InterBio Achieves ISO-9002 Certification

**I**nterBio, Inc., of Baton Rouge, LA, the world's largest manufacturer and distributor of microbes for environmental applications, has been awarded the ISO-9002 Quality System Certificate for quality assurance at its Houston, TX production facility. ISO 9002 was awarded to InterBio's Dublin, Ireland facility in 1987.

InterBio is a biotechnology company specializing in the development and production of microbiological products for use in industrial, municipal, sanitary, food service and consumer markets.

AIB-Vincotte, Brussels, a European-based certification board, granted the certification after InterBio underwent 18 months of intense preparation and a thorough audit conducted by AV Qualité of Houston, TX, in association with AIB-Vincotte. The company demonstrated adherence to program standards by providing well-documented procedures of all manufacturing processes ranging from order entry to purchasing, laboratory procedures, production and packaging.

"ISO certification is an international quality standard," explains Peter Perez, President and CEO of InterBio. "It is very important to have ISO-9002 certification, especially on products shipped out of the United States, into the European Community and Asia where ISO standards have become so popular," Perez says, explaining that many U.S. companies are currently at a competitive disadvantage. "The United States is coming along, but we're still notably behind in terms of ISO certification."

Although the certification will give the company a competitive edge in the international realm, Perez says it is the customers that will benefit the most.

"What it means for us is that we have systems in place so that tasks are done in a uniform, systematic way. However, the certification is most important to our customers in that it ensures them a consistent level of quality and service that is continuously improving," Perez says.

ISO registered companies are audited on a regular basis for continued ISO certification.

## Cooper Instrument Develops Temperature Control Training Kit

**T**emperature and time are key elements to preparing any food safely. With current emphasis on food safety, especially in the foodservice environment, cooking, storing and preparing foods at the proper temperature is crucial and often life-threatening if consequent temperature guidelines are not understood.

Cooper Instrument has developed a training kit to address these important industry issues. The kit features temperature and time products that are necessary holding, preparation and sanitation stages, plus a laminated food-holding temperature chart and 25 food-holding brochures. Certified food safety trainers are eligible for a



\$15 rebate, see kit for details.

Cooper Instrument Corporation is a leading, quality manufacturer of temperature, time and humidity instruments that cover a wide variety of industrial/commercial and household applications.

For more information, contact Susan Turro, Marketing Coordinator, Cooper Instrument at (800) 835-5011, x120.

# Affiliate News

## **WAMFS • WEHA • WADPFR Joint Conference '94**

The 15th Annual Joint Conference of the Wisconsin Association of Milk & Food Sanitarians, the Wisconsin Environmental Health Association and the Wisconsin Association of Dairy Plant Field Representatives will be held September 21 and 22 at the Country Inn Hotel & Conference Center in Pewaukee, WI.

The pre-registration fee for members is \$70, and \$80 for non-members. On-site registration fees for members and non-members are \$80 and \$90. Student or spouse registration for Educational Sessions is free. The conference fees include: an organized luncheon Wednesday and Thursday, Wednesday Evening Awards Banquet and refreshment breaks both days. Additional luncheon tickets are available for \$10 each, and additional banquet tickets are available for \$20 each.

For reservations, call the Country Inn Hotel & Conference Center at (414) 547-0201, (800) 247-6640 or FAX: (414) 547-0207.

## **Ontario Food Protection Association Seeks Mutual Assistance with Membership Awareness of Pertinent Food Safety Issues**

The Ontario Food Protection Association (OFPA) is a non-profit organization, and the mission of this association is to provide food safety professionals worldwide with a forum to exchange information on protecting the food supply. The OFPA produces a periodical entitled "Prophylaxis" which deals with current food-related topics such as ISO 9000 and its impact on food quality assurance programs. In addition, the OFPA organizes and sponsors annually, a one-day conference and one or two workshops. Recent examples of those efforts include interagency Hazard Analysis Critical Control Points (HACCP) policies and procedures and hands-on participation with new laboratory food testing techniques.

To find out if you would be interested in attending these events, in receiving the "Prophylaxis," in advertising your agencies' seminars/food safety information (articles) through "Prophylaxis," and if your membership/readership would like to have information about OFPA events, please contact: C. LeBer, DVM, DVPM; Disease Control Service, Ministry of Health, 5700 Yonge Street, 8th Floor, North York, Ontario 4K5; FAX: (416) 327-7439.

## **New York State Association of Milk and Food Sanitarians Announces 71st Annual Conference**

The 71st Annual Conference of the New York State Association of Milk and Food Sanitarians will be held September 20-22 at the Sheraton Airport, Cheektowaga, NY, just outside of Buffalo.

An excellent program has been developed by various committees. The program should be of interest to all. The opening night speaker, William Hill, will give a presentation on the history of Sorrento Cheese and the Buffalo plant. Other speakers on the agenda are from Cornell University, Diversey/Wyandotte, Penn State University, NY State Soil & Water Commission, NY State Dept. of Ag. & Markets, U.S. FDA, Grocery Products Manufacturers of Canada, and the National Restaurant Association. The spouses program will include attending the live TV show "AM Buffalo" and a special surprise. As always there will be the awards banquet and a cocktail hour to be held in the beautiful tropical courtyard of the Sheraton.

Room rates at the Sheraton Airport are \$80 for single or double. The cut-off date for making your reservations is August 30, 1994. To be assured of these rates it is advisable to make your reservation as soon as possible. Please register for the Conference with Janene Gargiulo so that your name tag will be waiting for you when you arrive. For more information, contact Janene Gargiulo, Executive Secretary, NYSAMFS, 172 Stocking Hall, Ithaca, NY 14853; phone: (607)255-2892.

## **Missouri Milk, Food & Environmental Health Association Announces New Officers**

The MMFEHA Executive Board Members for 1994-95 are as follows:

President: Terry Long, Jefferson City, MO  
President Elect: Janet Murray, Moberly, MO  
Vice President: Diana Pasley, Hillsboro, MO  
Secretary: Linda Wilson, Springfield, MO  
Treasurer: David Stull, Jefferson City, MO  
Past President: Calvin Badding, Jefferson City, MO

## **Wisconsin Laboratory Association Sets Up Program for 18th Annual Education Conference**

The Wisconsin Laboratory Association has set the program for its 18th Annual Education Conference to be



held September 8 and 9, 1994.

Thursday will start out with a welcome from Sam Miunde, WLA President followed by an update on Cryptosporidium by Jeff MacDonalds and an opportunity to look at the latest in laboratory equipment and talk with suppliers.

Then there will be three topic areas to choose from. **Food and Dairy** topics include: Applications of Food Biopreservatives, by Dr. Steve Ridley, UW River Falls, Microbial Ecology and Control in Meat Plants by Jeff Kornacki of Silliker Labs, and a presentation about legal issues in Quality Assurance by Kathleen Manner of WI Dept. of Agriculture. **Environmental and Public Health** topics include: an update on Tuberculosis by Dawn Tuckey, Microbial Testing in Public Water Supplies by Don Swailes of WDNR and Environmental Lead and Lab Certification by Joe Schirmer of WI Bureau of Public Health. **Waste Water and Environmental Testing** topics include: Lab Certification (NR149) by Ron Arneson, Groundwater Sampling Methods by Charlie Ostrgen, and DRO/GRO PVOC Gas Chromatographic Methods by Laura Ceruti of Hewlett Packard.

Friday's speakers will include: Dr. Deibel of Deibel Laboratories, discussing Quality Standards for Laborato-

ries, Janet Raddatz of Sargento Cheese on Laboratory Certification, Julia Riley of DNR will talk about NR216, the new Stormwater Regulations. Professors George Nelson from UW Stout and P.C. Vasavada from UW River Falls will team up to present a seminar on Rapid Methods for Microbial Examination.

There will be opportunities to view the Supplier's display on Friday and also to take a tour of the Milwaukee Metropolitan Sewer District facilities with Chris Magruder.

The Conference will be held at the Country Inn Hotel & Conference Center, 2810 Golf Road, Waukesha, WI. Members will be receiving registration information on the first week in August in Benchtalk. All other interested persons should call Mary Ellen Teston at (608) 266-4053 for more information and registration materials, or write to WLA, P.O. Box 28045, Green Bay, WI 54304.

### **PAMFES Announces Annual Meeting**

The Pennsylvania Association of Milk, Food and Environmental Sanitarians will be holding its Annual Meeting on November 1, 2 and 3, 1994 at the Nittany Lion Inn in University Park, PA.

# New IAMFES Members

## ALABAMA

**Dawn Autrey**  
State of Alabama, Montgomery

## ARGENTINA

**Nora Cristina Ballabene**  
Alpe, S.A., Belgrano

## ARIZONA

**Kristina Crabtree**  
University of Arizona, Tucson

## AUSTRALIA

**Glen Pinna**  
Biotech Laboratories Pty., Ltd.,  
Brisbane

## BRAZIL

**Jose Assis Faria**  
Unicamp, Campinas-SP

## CALIFORNIA

**Hailu Kinde**  
University of California, San  
Bernardino

**Mary Kim Snyder**  
Kraft General Foods, Tulare

**Phyllis J. Evans**  
Fresh Express, Salinas

## CANADA

**Kate Harrigan**  
DIPIX Technologies, Ottawa,  
Ontario

**Robert Thompson**  
Wellington Dufferin Guelph  
Health, Fergus, Ontario

**Anita Hiu Mui Choi**  
University of Saskatchewan,  
Saskatoon, Saskatchewan

## COLORADO

**Tim Starzl**  
DDX, Inc., Boulder

## DELAWARE

**Scott Fritschel**  
DuPont, Wilmington

## DENMARK

**Jesper Axis**  
Biotechnological Institute,  
Kolding

## DISTRICT OF COLUMBIA

**Ray Beaulieu**  
FDA, Washington

## GEORGIA

**Dan Herman**  
Rich-SeaPak, St. Simons Island

## INDIANA

**Holly Huepenbecker-Hull**  
Ben & Jerry's Homemade, Inc.,  
Ft. Wayne

## IOWA

**Yolande Crawford**  
Iowa State University, Ames

## ILLINOIS

**Joan I. Minter**  
Warner-Lambert, Rockford

**Marlena Bordson**  
Illinois Dept. of Public Health,  
Springfield

## KENTUCKY

**Donald E. Poore**  
Baskin Robbins, Owensboro

## MAINE

**Susan Faust**  
Idexx Laboratories, Westbrook

## MARYLAND

**David Kluck**  
Caterair International, Bethesda

**V. Kelly Bunning**  
U.S. Food & Drug Administra-  
tion, Laurel

## MASSACHUSETTS

**Ellen A. Fitzgibbons**  
Agri-Mark, Inc., West Springfield

## MEXICO

**Inocencio Higuera**  
CIAD, A.C., Hermosillo, Sonora

## MICHIGAN

**Jairus David**  
Gerber Products, Fremont

**Robert Hause**  
Van Buren Co. Health Dept.,  
Hartford

**Durwood Zank**  
Barry Eaton Dist. Health Dept.,  
Charlotte

## MINNESOTA

**Kurt Deibel**  
Minneapolis

## NEW JERSEY

**Cynthia Lee Martin**  
Rutgers, New Brunswick

**NEW YORK**

**Kurt Buckman**  
Comstock Michigan Fruit,  
Penfield

**Bob Miller**  
Diversey Corp., Huntington  
Station

**Philippe Pages**  
Dannon, Inc., Tarrytown

**Valerie Reid**  
International Multifoods, New  
Rochelle

**NORTH CAROLINA**

**Aubrey Mendonca**  
Greensboro

**Roger W. Fortman**  
State of North Carolina, Raleigh

**OREGON**

**Martin Warp**  
Oregon Lox Co., Springfield

**TEXAS**

**Mike Swan**  
B & G Chemical, Dallas

**Sharon Winders**  
Professional Service Industries,  
Arlington

**Steve Young**  
Professional Service Industries,  
Arlington

**David Humphrey**  
Professional Service Industries,  
San Antonio

**Fred Reimers**  
H.E.B. Grocery, San Antonio

**Eric Matheu**  
Pace Foods, Ltd., San Antonio

**J. Ron Sanchez**  
Pace Foods, Ltd., San Antonio

**Patricia Simmons**  
U.S.A.F., San Antonio

**Pat Quick**  
U.S.A.F., San Antonio

**TURKEY**

**Deniz Goktan**  
Ege University, Bornova, Izmir

**UNITED KINGDOM**

**Roy Smither**  
Celsis Ltd., Cambridge

**UTAH**

**Ed Kopecky**  
Smith's Food & Drug Centers,  
Salt Lake City

**Kurtis Ownly**  
Smith's Food & Drug Centers,  
Salt Lake City

**Dan Lukes**  
Smith's Food & Drug Centers,  
Salt Lake City

**VERMONT**

**Todd J. Pritchard**  
University of Vermont,  
Burlington

**VIRGINIA**

**Maryanna F. Fisher**  
Virginia State Health Dept.,  
Richmond

**WASHINGTON**

**Will J. Satau**  
Mason County Health Services,  
Shelton

**Bonnie Halvorson**  
Bremerton-Kitsap Co. Hlth. Dist.,  
Bremerton

**WISCONSIN**

**Owen Olesen**  
Red Star Specialty, Milwaukee

**Wendy Franke**  
Universal Foods, Juneau

**Douglas Schaefer**  
G. Heilman Brewing Company,  
Inc., La Crosse

**Edward F. Marshall**  
Lipha Tech, Inc., Milwaukee

**WYOMING**

**Laurie Leis**  
Wyoming Department of  
Agriculture

**NEW IAMFES SUSTAINING MEMBER**

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3401 S.W. 40 Blvd., Gainesville, FL 32608  
(904) 378-5555

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- ESCC Control Samples
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(612) 785-0484

FAX (612) 785-0584

CIRCLE READER SERVICE NO. 356



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800-541-2116

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### Michelson Laboratories, Inc.

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- Sugar Profile
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- Antibiotic Analysis
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and Inspection seeks position  
as a **Quality Assurance/Field  
Specialist**

Qualifications Include:

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- Some HACCP Enforcement &  
Implementation
- Laboratory Equipment  
Experience
- Electron Microscopy  
Experience
- Pathogen Isolation Identification

**Prefer Northeast Area  
(But Would be  
Willing to Relocate)**

CIRCLE READER SERVICE NO. 305

# Coming Events

1994

## OCTOBER

- 3-4, The 13th Annual Midwest Food Processing Conference**, sponsored by the Illinois, Wisconsin, Iowa and Minnesota Sections of IFT will present "Food Technology — Its Future in Global Economy" as the theme of this year's conference. Registration fees are \$85.00 prior to September 23, \$100.00 thereafter. For further information, call David LeValley, MFPC Chairman at (708) 433-5880 or Robert Irbe, Program Chairman at (708) 506-28226, or Paul Brewer, Publicity Chairman, at (608) 837-0076.
- 3-5, SERVSAFE® Serving Safe Food Seminar**, in Nashville, TN. Co-sponsored by the Tennessee Restaurant Association, located at the Ramada Hotel. For additional information or to register, contact The Educational Foundation's customer service department at (800) 765-2122.
- 3-5, Sanitation and Quality Assurance Manager's Update**, Manhattan, KS; a course offered by the American Institute of Baking. For more information, call (800) 633-5137 or (913) 537-4750.
- 4-5, How to Write Your OSHA Required Programs**, Kansas City, MO; a course offered by the American Institute of Baking. For more information, call (800) 633-5137 or (913) 537-4750.
- 5-7, New York State Registry of Sanitarians 1994 Educational Conference** will be held at the Villa Roma Resort Hotel, Callicoon, NY. For more information, contact Susan Jones (516) 727-8947 or Michele Hecht (516) 349-5816.
- 5-8, 1994 International Dairy Show**, sponsored by the International Dairy Foods Association, Milk Industry Foundation, National Cheese Institute and International Ice Cream Association, co-sponsored by the American Butter Institute, will be held at the Minneapolis Convention Center, Minneapolis, MN. For more information, contact International Dairy Show Convention Management at (703) 876-0900.
- 6-7, Sanitation Through Design**, Manhattan, KS; a course offered by the American Institute of Baking. For more information, call (800) 633-5137 or (913) 537-4750.
- 11-12, Food Plant Sanitation**, City of Industry, CA; a course offered by the American Institute of Baking. For more information, call (800) 633-5137 or (913) 537-4750.
- 12-13, Iowa Association of Milk, Food and Environmental Sanitarians Annual Meeting** will be held at the Best Western Starlite Village (formerly the Ramada Hotel), Waterloo, IA. For more information, call Dale Cooper at (319) 927-3212.
- 12-13, Seafood Quality Evaluation Workshop for Analytical Laboratories and the Seafood Industry**, co-sponsored by the University of California Cooperative Extension, Sea Grant Extension Program; U.S. Food and Drug Administration; U.S. Department of Commerce; and National Food Processors Association, will be held at the Doubletree Hotel and Marina in San Pedro, CA. For further information, contact Bob Price (916) 752-2194 or Pamela Tom (916) 752-3837.
- 17-19, Human Resource Conference**, Manhattan, KS; a course offered by the American Institute of Baking. For more information, call (800) 633-5137 or (913) 537-4750.
- 19-20, North Central Cheese Industries Association Annual Conference** to be held at the Holiday Inn, Brookings, South Dakota. For further information, contact E. A. Zottola, Executive Secretary, NCCIA, Box 8113, St. Paul, MN 55113.
- 21-22, Breakfast Cereal Technology**, sponsored by the American Association of Cereal Chemists, will be held in Minneapolis, MN. For more information, contact Marie McHenry, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121. Phone (612) 454-7250; FAX (612) 454-0766.
- 24-26, SERVSAFE® Serving Safe Food Seminar**, in Chicago, IL. Co-sponsored by the Illinois Restaurant Association, held at the Midland Hotel. For additional information or to register, contact The Educational Foundation's customer service department at (800) 765-2122.
- 24-November 25, Dairy Technology Module I - Technology of Fluid Milk Production and Processing**. The technology of milk production from the farm through plant processing of fluid milk products. Includes handling, distribution and marketing; aspects of quality control, basic chemistry and microbiology, sanitation and product testing associated with the fluid milk industry. Cost: \$873.00. For more information, contact Mr. A. W. Hydamaka at (204) 474-9621; FAX (204) 261-1488.
- 25-26, Microbiological Concerns in Food Plant Sanitation & Hygiene**; a 2-day Silliker interactive course to be held in Dallas/Fort Worth, TX. If you would like to register, or have questions about the course, contact Silliker's Education Services Department at (708) 957-7878.
- 25-26, HACCP for Meat and Poultry Processors**, a two-day interactive workshop designed for those responsible for implementing a HACCP plan in a processing plant, will be held in Dallas, TX. Sponsored by Silliker Laboratories Group, Inc., more information is available by calling Silliker's Education Services Dept. at (800) 829-7879.
- 25-26, Illinois Environmental Health Association's Annual Education Conference** will be held at the Hotel Pere Marquette in Peoria, IL. For more information, call (708) 682-7979, ext. 7196.
- 31-Nov. 1, Bread and Rolls Production**, Seattle, WA; a course offered by the American Institute of Baking. For more information, call (800) 633-5137 or (913) 537-4750.
- 31-Nov. 2, Aseptic Processing and Packaging Workshop**, on the UC Davis Campus. The \$1,450.00 fee includes lunches. Class size is limited, so early enrollment is advised. To request more information or to enroll, call toll free in California (800) 752-0881. Outside California, call (916) 757-8777.
- 31-Nov. 3, Baking Technology**, a short course presented by The Center for Professional Advancement. Emphasis will be placed on major industry products and processes, as well as trends in industry processing methods. For more information on this and other courses, please contact: Registrar, The Center for Professional Advancement, P.O. Box 1052, East

Brunswick, NJ 08816; phone (908) 613-4500; FAX (908) 238-9113.

## NOVEMBER

- 1, **Associated Illinois Milk, Food and Environmental Sanitarians Fall Annual Meeting**, at the Carlisle in Lombard, IL. For more information, contact Bob Crombie at (815) 726-1683.
- 1-2, **Food Plant Sanitation**, Toronto, Ontario, Canada; a course offered by the American Institute of Baking. For more information, call (800) 633-5137 or (913) 537-4750.
- 2-3, **North Dakota Environmental Health Assn. Annual Educational Conference** will be held at the International Inn, Williston, ND. For more information, contact Deb Larson at (701) 221-6147.
- 2-7, **Fifth Panamerican Dairy Congress, the International Fair of the Dairy Industry and Dairy Cattle Exhibition**, co-sponsored by the Panamerican Dairy Federation, FEPALE and the COLANTA Dairy Cooperative, will be held in Medellín, Columbia, South America.
- 3-4, **Bread and Rolls Production**, San Jose, CA; a course offered by the American Institute of Baking. For more information, call (800) 633-5137 or (913) 537-4750.
- 3-4, **Safety for the Supervisor**, Louisville, KY; a course offered by the American Institute of Baking. For more information, call (800) 633-5137 or (913) 537-4750.
- 7-9, **SERVS SAFE® Serving Safe Food Seminar**, in Boston, MA. Co-sponsored by the Massachusetts Restaurant Association, held at the Cambridge Howard Johnson. For additional information or to register, contact The Educational Foundation's customer service department at (800) 765-2122.
- 7-9, **SERVS SAFE® Serving Safe Food Seminar**, in New Orleans, LA. Co-sponsored by the Louisiana Restaurant Association, held at the Westin Canal Place. For additional information or to register, contact The Educational Foundation's customer service department at (800) 765-2122.
- 7-9, **SERVS SAFE® Serving Safe Food Seminar**, in San Francisco, CA. Co-sponsored by the California Restaurant Association, held at the San Francisco Marriott-Fisherman's Wharf. For additional information or to register, contact The Educational Foundation's customer service department at (800) 765-2122.
- 7-10, **Cookie and Cracker Technology for Allied and Associated Personnel**, Manhattan, KS; a course offered by the American Institute of Baking. For more information, call (800) 633-5137 or (913) 537-4750.
- 7-10, **Second Saudi Symposium and Exhibition on Food and Nutrition** will be held at King Saud University campus in Riyadh, Saudi Arabia. For more information, contact the Food Science Department at (966) 467-8407; FAX (966) 467-8394.
- 9-10, **Separations Technologies: Markets and Applications**. Location: Royal Sonesta Hotel, Cambridge, MA. For more information, contact Program Division, Technomic Publishing Company, Inc., 851 New Holland, Ave., Box 3535, Lancaster, PA 17604; phone (717) 291-5609; FAX (717) 295-4538. Toll-free U.S. and Canada: (800) 223-9936.
- 14-18, **Maintenance and Management**, Manhattan, KS; a course offered by the American Institute of Baking. For more information, call (800) 633-5137 or (913) 537-4750.

•17-18, **ISO 9000 Registration Workshop**, Manhattan, KS; a course offered by the American Institute of Baking. For more information, call (800) 633-5137 or (913) 537-4750.

•30-Dec. 2, **Muffin and Doughnut Technology**; Manhattan, KS; a course offered by the American Institute of Baking. For more information, call (800) 633-5137 or (913) 537-4750.

## DECEMBER

- 5-7, **SERVS SAFE® Serving Safe Food Seminar**, in Chicago, IL. Co-sponsored by the Illinois Restaurant Association, held at the Midland Hotel. For additional information or to register, contact The Educational Foundation's customer service department at (800) 765-2122.
- 5-8, **Toxics Release Inventory Data Use Conference 1994: Building TRI and Pollution Prevention Partnerships**, The Park Plaza Hotel, Boston, MA. For more information, contact Madsen Marketing Strategies, 31 Kidder Avenue, Somerville, MA 02144; phone (617) 666-1431; FAX (617) 628-9297.
- 6-7, **Understanding Industrial Motor Controls**, Chicago, IL; a course offered by the American Institute of Baking. For more information, call (800) 633-5137 or (913) 537-4750.
- 6-7, **Hazard Analysis Critical Control Points (HACCP) — a Basic Concept for Food Protection...**, to be held at the University of California, Davis, CA. For more information, call (800) 752-0881 in California; (916) 757-8777 outside of California; or FAX (916) 757-8558.
- 7-9, **Basic Safety School**, Phoenix, AZ; a course offered by the American Institute of Baking. For more information, call (800) 633-5137 or (913) 537-4750.
- 12-13, **Thermal Processing of Foods I; Operation of Pasteurizer Equipment**. Fee to be established. For more information, contact Mr. A. W. Hydamaka at (204) 474-9621; FAX (204) 261-1488.
- 13-14, **Understanding Industrial Motor Controls**, Kansas City, MO; a course offered by the American Institute of Baking. For more information, call (800) 633-5137 or (913) 537-4750.
- 14-15, **Thermal Processing of Foods II: Testing of Pasteurizer Equipment and Controls**. Fee to be established. For more information, contact Mr. A. W. Hydamaka, at (204) 474-9621; FAX (204) 261-1488.

## 1995

### JANUARY

- 3-5, **Milling for Cereal Chemists**, sponsored by the American Association of Cereal Chemists, will be held in Kansas State University, Manhattan, KS. For more information, contact Marie McHenry, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121. Phone (612) 454-7250; FAX (612) 454-0766.
- 9-February 10: **Dairy Technology Module II — Technology of Cheese and Concentrated Milk Products**. The principles and practices relating to the manufacture of cheese. Includes selection and evaluation of raw materials plus lactic cultures, processing, packaging, storage and distribution.

Aspects of quality control, product testing, judging and grading associated with cheese production. Cost: \$873.00. For more information, contact Mr. A. W. Hydamaka, at (204) 474-9621; FAX (204) 261-1488.

•**16-17, Wheat Gluten: Chemistry and Technology**, sponsored by the American Association of Cereal Chemists, will be held in Kansas City, MO. For more information, contact Marie McHenry, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121; phone (612) 454-7250; FAX (612) 454-0766.

•**18, Dough Modifiers**, sponsored by the American Association of Cereal Chemists, will be held in Kansas City, MO. For more information, contact Marie McHenry, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121; phone (612) 454-7250; FAX (612) 454-0766.

•**18-21, U.S. Dairy Forum**, sponsored by the International Dairy Foods Association, will be held at La Quinta Resort and Club in Palm Springs, CA. For more information, call (202) 737-IDFA.

•**19, Food Surfactants**, sponsored by the American Association of Cereal Chemists, will be held in Kansas City, MO. For more information, contact Marie McHenry, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121; phone (612) 454-7250; FAX (612) 454-0766.

## FEBRUARY

•**6-9, Freezing Technology Short Course**, on the UC-Davis Campus. This intensive course teaches the fundamentals of freezing specific commodities and includes hands-on demonstrations. To enroll or request more information, call toll free in California (800) 752-0881. Outside of California, call (916) 757-8777.

•**8-10, Eighth Australian Food Microbiology Conference** to be held in Melbourne. Utilizing a mixture of local and international speakers, drawn from the key areas of the industry, Academia and Research, the aim of this conference is to provide a wide range of topics of interest to the Food Microbiology Industry. In addition, a poster session will be conducted. For more information, contact Kim King, Conference Secretariat, Food Micro '95, GPO Box 128, Sydney NSW 2001, Australia; phone 61-2-262-2277; FAX 61-2-262-2323.

•**13-14, 4th Annual Cheese Symposium to Introduce Product Research Results**, to be held in Burlingame, CA. The conference focuses on the latest developments in cheese

science and technology, and introduces the results of dairy products related research. To enroll or request more information, call toll free in California (800) 752-0881. Outside of California, call (916) 757-8777.

## MARCH

•**2-4, Introduction to Statistical Methods for Sensory Evaluation of Foods**; a course to be offered at the UC-Davis campus. The fee is \$575.00 and includes one dinner, two lunches and the course text or manual. For more information or to enroll, call toll free in California (800) 752-0881. Outside California, call (916) 757-8777.

•**6-8, Sensory Evaluation: Overview and Update**, an additional course offered at the UC-Davis campus. The fee is \$575.00, or \$1,000 to attend both this and the "Introduction to Statistical Methods for Sensory Evaluation of Foods." For more information or to enroll, call toll free in California (800) 752-0881. Outside California, call (916) 757-8777.

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To insure that your meeting time is published, send announcements at least 90 days in advance to: IAMFES, 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2838.



## IAMFES Offers the Northeast Dairy Practices Council (NDPC) "Guidelines for the Dairy Industry"

At the urging of our **Dairy Quality and Safety Professional Development Group**, IAMFES has entered into an agreement with the Northeast Dairy Practices Council (NDPC) to distribute their "Guidelines for the Dairy Industry." NDPC is a non-profit organization of education, industry and regulatory personnel concerned with milk quality and sanitation throughout 15 northeastern/mid-Atlantic states. Interestingly, its membership and subscriber rosters list individuals and organizations throughout the United States, Canada and Japan.

For the past 25 years, NDPC's primary mission has been the development and distribution of educational guidelines directed to proper and improved sanitation practices in the production, processing, and distribution of high quality fluid milk and manufactured dairy products.

The NDPC Guidelines are written by professionals who comprise five permanent Task Forces. Prior to distribution, every Guideline is submitted for approval to the key milk control sanitarian in each of the 15 states which are now active participants in the NDPC process. Should any official have an exception to a section of a proposed guideline, that exception is noted in the final document.

Although the Guidelines are developed east of the Mississippi River, clearly they have a high degree of applicability wherever cows are milked and milk is transported, processed and distributed.

The Guidelines are renowned for their common sense and useful approach to proper and improved sanitation practices. We think that they will be a valuable addition to your professional reading library.

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### The entire set consists of 48 guidelines including:

- |   |   |
|---|---|
| 1 Dairy Cow Free Stall Housing  | 32 Fat Test Variations in Raw Milk  |
| 2 Effective Installation, Cleaning and Sanitizing of Milking Systems                            | 33 Brucellosis and Some Other Milkborne Diseases                                  |
| 3 Selected Personnel in Milk Sanitation   | 34 Butterfat Determinations of Various Dairy Products                             |
| 7 Sampling Fluid Milk   | 35 Dairy Plant Waste Management   |
| 8 NE Ext. Publ., Conferences, Short Courses, Correspondence Courses and Visual Aids in Dairying | 36 Dairy Farm Inspection  |
| 9 Fundamentals of Cleaning and Sanitizing Farm Milk Handling Equipment                          | 37 Planning Dairy Stall Barns   |
| 10 Fluid Milk Shelf-Life  | 38 Preventing Off-flavors in Milk   |
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- 

If purchased individually, the entire set would cost \$174. We are offering the set, packaged in three loose leaf binders for \$125 plus \$9 shipping and handling (outside the U.S., \$21 for shipping and handling).

Information on how to receive new and updated Guidelines will be included with your order.

To purchase this important source of information, complete the order form below and mail or FAX (515-276-8655) to IAMFES.

Please enclose \$125 plus \$9 shipping and handling for each set of Guidelines. Shipments outside the U.S. are \$125 plus \$21 shipping and handling.

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

## MEMBERSHIP APPLICATION

Effective September 1, 1994

### MEMBERSHIP

- Membership Plus \$90**  
(Includes *Dairy, Food and Environmental Sanitation* and the *Journal of Food Protection*)
- Membership with *Dairy, Food and Environmental Sanitation* \$60**
- Check here if you are interested in information on joining your state/province chapter of IAMFES**

### SUSTAINING MEMBERSHIP

- Membership with BOTH journals \$450**  
Includes exhibit discount, July advertising discount, company monthly listing in both journals and more.

### STUDENT MEMBERSHIP\*

- Membership Plus including BOTH journals \$45**
- Membership with *Dairy, Food and Environmental Sanitation* \$30**
- Membership with the *Journal of Food Protection* \$30**  
\*Full-time student verification must accompany this form.

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

**IAMFES Booklets**

New Prices Effective May 1, 1994

Quantity		Total \$
_____	Procedures to Investigate Waterborne Illness \$6.00/member; \$9.00/non-member	_____
_____	Procedures to Investigate Foodborne Illness - 4th Edition \$6.00/member; \$9.00/non-member	_____
_____	Procedures to Investigate Arthropod-borne and Rodent-borne Illness \$6.00/member; \$9.00/non-member	_____
_____	Procedures to Implement the Hazard Analysis Critical Control Point System \$6.00/member; \$9.00/non-member	_____
_____	Pocket Guide To Dairy Sanitation \$.50/member; \$.75/non-member (minimum order of 10) (\$2.50 shipping for each order of 10)	_____

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| <input type="checkbox"/> Dairy/Food Processors   | <input type="checkbox"/> Sanitation/Cleaning Equipment, Products, Services, Supplies                 |
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## IAMFES

International Association of Milk, Food and Environmental Sanitarians Inc.

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

The Advertisements included herein are not necessarily endorsed by the International Association of Milk, Food and Environmental Sanitarians, Inc.

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106	119	132	145	158	171	184	197	210	223	236	249	262	275	288	301	314	327	340	353
107	120	133	146	159	172	185	198	211	224	237	250	263	276	289	302	315	328	341	354
108	121	134	147	160	173	186	199	212	225	238	251	264	277	290	303	316	329	342	355
109	122	135	148	161	174	187	200	213	226	239	252	265	278	291	304	317	330	343	356
110	123	136	149	162	175	188	201	214	227	240	253	266	279	292	305	318	331	344	357
111	124	137	150	163	176	189	202	215	228	241	254	267	280	293	306	319	332	345	358
112	125	138	151	164	177	190	203	216	229	242	255	268	281	294	307	320	333	346	359
113	126	139	152	165	178	191	204	217	230	243	256	269	282	295	308	321	334	347	360

## IAMFES

International Association of Milk, Food and Environmental Sanitarians Inc.

DFES  
9/94

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102	115	128	141	154	167	180	193	206	219	232	245	258	271	284	297	310	323	336	349
103	116	129	142	155	168	181	194	207	220	233	246	259	272	285	298	311	324	337	350
104	117	130	143	156	169	182	195	208	221	234	247	260	273	286	299	312	325	338	351
105	118	131	144	157	170	183	196	209	222	235	248	261	274	287	300	313	326	339	352
106	119	132	145	158	171	184	197	210	223	236	249	262	275	288	301	314	327	340	353
107	120	133	146	159	172	185	198	211	224	237	250	263	276	289	302	315	328	341	354
108	121	134	147	160	173	186	199	212	225	238	251	264	277	290	303	316	329	342	355
109	122	135	148	161	174	187	200	213	226	239	252	265	278	291	304	317	330	343	356
110	123	136	149	162	175	188	201	214	227	240	253	266	279	292	305	318	331	344	357
111	124	137	150	163	176	189	202	215	228	241	254	267	280	293	306	319	332	345	358
112	125	138	151	164	177	190	203	216	229	242	255	268	281	294	307	320	333	346	359
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Flavor	:	good
DMC	:	12500
Cryoscope	:	519
Temperature	:	36
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