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DAIRY, FOOD AND ENVIRONMENTAL

Sanitation

A PUBLICATION OF THE INTERNATIONAL ASSOCIATION FOR FOOD PROTECTION, INC. JANUARY 2000

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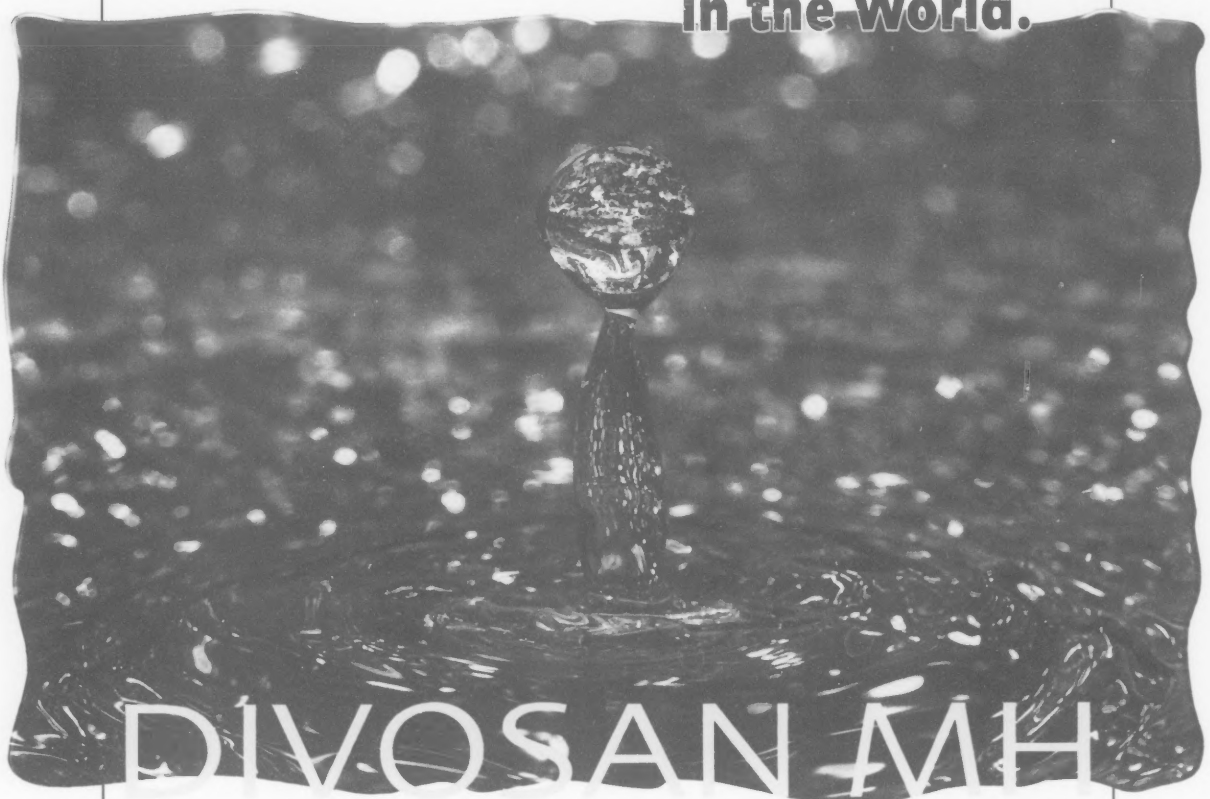

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Introducing the new name and theme for the International Association for Food Protection.

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Sanitation

International Association for Food Protection

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DAIRY, FOOD AND ENVIRONMENTAL

Sanitation

A PUBLICATION OF THE INTERNATIONAL ASSOCIATION FOR FOOD PROTECTION

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A Note from the Scientific Editor... Bill LaGrange

Why not submit a manuscript for possible publication in *Dairy, Food and Environmental Sanitation*? The results of your research or that of a professional experience should be shared with other Members of the International Association for Food Protection. We all need to continue to learn from the experiences and discoveries of others. Publishing in *DFES* is an excellent way to share your information.

Each manuscript, after being received at the Association office, is reviewed by two members of the *DFES* Editorial Board to make sure it conforms to the *DFES* manuscript guidelines. The Instructions for Authors are published in this issue on page 59 or can be seen on the Association's Web site at www.foodprotection.org. Questions about manuscript format can be answered by Donna Bahun, *DFES* Production Editor, at 515.276.3344; E-mail: dbahun@foodprotection.org.

Please consider preparing a manuscript for *Dairy, Food and Environmental Sanitation*. By publishing your research and/or professional experiences, over 3,000 International Association for Food Protection Members will benefit. If you have any questions about your ideas for a manuscript, please call me at 515.294.3156; E-mail: foodsci@exnet.iastate.edu. Thank you.

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2001

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DAIRY, FOOD AND ENVIRONMENTAL

Sanitation

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QUOTATIONS

FROM JACK

By JACK GUZEWICH
President

"The acronym should be said as four letters I-A-F-P"

By the time you read this column the millennium will have passed and presumably the world will not have come to an end in spite of all of the dire predictions to the contrary. As of January 1, 2000, our name has changed from the International Association of Milk, Food and Environmental Sanitarians to the International Assoc-iation for Food Protection.

One of the issues Members voiced when we proposed our name change was how do we pronounce the new acronym? Do we try to make a word out of IAFP e.g., eye-eh-ff-pa or do we just say all four letters I-A-F-P? Knowing that such issues can create hours of debate, the Executive Board discussed this topic and recommends that the acronym be pronounced as four letters I-A-F-P. Just as we say NFPA or USDA, we will now say IAFP, with no attempt to make the letters into some kind of word.

It is important to stress that the mission of our organization has not changed. IAFP will continue "To provide food safety professionals worldwide with a forum to exchange information on protecting the food supply." We will continue to fulfill our mission through our two outstanding journals and other publications, our hugely successful Annual Meeting, our workshops and our expanding Web page.

With the new name, came the need for a new Association image, including a new logo. I received some questions regarding our new logo and how it was selected. I never knew choosing a logo could be so involved. A commercial artist developed our logo after discussions with our staff in Des Moines and with the Executive Board. Several different concepts were discussed. The one chosen attempts to represent the blue of the sky and water, and the green of the plants on the earth. The colors wrap around each other to show the inter-relatedness and interdependence of the natural environment and how our organization represents a global membership working together to assure protection of the food supply. I suspect this is a bit abstract for some of us "just-give-me-the-facts" types, but we could find no simple collection of familiar objects to represent the diversity in the Association, therefore we had to think outside the traditional box. We believe the logo is quite attractive and hope you agree.

Our goal is that the new name will attract new Members from around the globe. As a forum for exchange of information on protecting the food supply, we need to have the relevant professions well represented including physicians, epidemiologists, veterinarians and food inspectors as well as our core of industry, government, education and research professionals. To this end, I am requesting all our Members to identify potential new Members. Your encouragement may be just what they need to become involved with the premier food safety organization. Please join me in pursuing our goal of increasing our Membership base. With an increased number of Members, comes increased knowledge and resources for all.

THE BLACK PEARL AWARD

RECOGNITION FOR CORPORATE EXCELLENCE IN FOOD SAFETY AND QUALITY

NOMINATE TODAY!

The Black Pearl Award is presented annually at the International Association for Food Protection Annual Meeting.

The Black Pearl Award, sponsored by Wilbur Feagan and F&H Food Equipment Company, was first presented in 1994. The Black Pearl Award was established to recognize a company for outstanding commitment to and achievement in corporate excellence in food protection. For more information and to receive nomination criteria, contact the International Association for Food Protection office at 800.369.6337 or 515.276.3344; Fax: 515.276.8655; E-mail: info@foodprotection.org.

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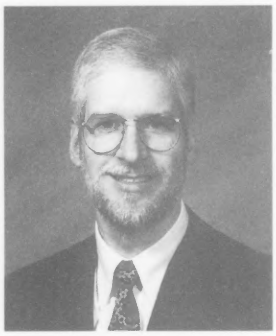
COMMENTARY

FROM THE EXECUTIVE DIRECTOR



By DAVID W. THARP
Executive Director

"Recruit a new Member to join the Association"

It is now official; the name of the Association is now the International Association for Food Protection. This begins a new era in the life of this Association that generates excitement and anticipation for what the future will provide. We feel the new name provides a great opportunity for growth in Membership, growth in international Membership and growth in the Annual Meeting. You may ask, how do we plan to achieve this growth? Well, let us take a little time to review our plans.

We feel our expectations are realistic and achievable. For the Annual Meeting, we want to see slow growth in attendance to 1,500 attendees over the next three to five years. At the 1999 Annual Meeting, we had just over 1,130 attendees. Membership participation is up over the last few years and we expect to keep this same growth trend moving. Just two years ago, we had between 2,700 and 2,800 Members. Today we have exceeded 3,000 Members and expect to reach 3,500 in less than five years – sooner with your help!

I hope you took a good look at the cover of this month's *Dairy, Food and Environmental Sanitation*. The cover shows a new "image" for the Association and something you will see carried through various Membership materials, our exhibit booth, and our Member vision cards. Member vision card – what is that? A Member vision card is a card that presents a topic for your consideration as a Member of the Association. The Association mission, use of the Web site, committee involvement, and Annual Meeting attendance are topics for upcoming vision cards. The cards are suitable for placing in a small picture frame to display for colleagues to notice. It is our hope that by displaying these cards, Members will begin conversations with their colleagues and encourage their involvement and Membership in the Association. It is a great form of subtle, visual promotion for the Association. We invite and encourage your participation. This is an important leg of promoting the new name! You received the first card with the Call for Awards Nominations that mailed in December. Other cards will follow with various mailings throughout this year.

All of our Membership materials were designed around the theme shown on the journal cover. This will help identify the International Association for Food Protection by sight as well as by name. Our name and new logo will also become more visible and consistently used to provide a constant reminder of the quality reputation of the Association. Even with the use of new materials, we still need each and every Member's help to grow the Association. President Guzewich has called for action and I want to repeat the call for each Member to take it on him or herself to recruit a new Member to join the Association. If we can help by sending a sample copy of either *Dairy, Food and Environmental Sanitation* or

Journal of Food Protection (or both), just contact our office and we are happy to fulfill your request.

Soon you will receive a new Membership card and Certificate of Membership. Be sure to keep your Membership card in a safe place. By March, we expect to have a "Members only" section on our Web site (www.foodprotection.org) that will include access to the Membership directory. You will need your Membership number (on your Member card) to enter the "Members only" section of the Web site, so again, keep your Membership card safe!

We hope that you like the new materials and the new "image" for your Association. We look forward to your assistance in bringing new Members to the International Association for Food Protection! With your help, we can truly prosper. Thanks for your support of the Association.

Nominate a Colleague Today for the Association Fellows Award

The purpose of the Fellows Award is to honor and recognize Association Members who have contributed to the International Association for Food Protection and its Affiliates with quiet distinction over a prolonged period of time.

The nominee must be a current International Association for Food Protection Member, and must have been a Member of the Association for 15 or more consecutive years.

Nomination deadline is February 18, 2000. Nomination forms must be received at the Association office by this date.

International Association for Food Protection

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Dairy, Food and Environmental Sanitation, Vol. 20, No. 1, Pages 14-23

Microbial Transfer During Cutting and Deboning of Pork in a Small-Scale Meat Processing Plant

Matthias Upmann,[1*] Peter Jakob,[2] and Gerhard Reuter[3]

SUMMARY

The processing hygiene in a small-scale meat cutting and deboning company was examined during 39 work shifts. In a microbiological step control procedure, 772 wet-dry double swab samples were taken from the premise's equipment; 408 destructive surface samples were taken from pig carcass rinds and freshly cut pig meat surfaces. Total aerobic cell counts and *Enterobacteriaceae* counts were determined.

Based on changes in surface bacterial load during the work shift, company installations were classified into four groups: (1) increasing bacterial load (most cutting installations); (2) no change in high level bacterial loads (rough cutting board, transportation containers); (3) no change in low level bacterial loads (premise interior); and (4) decreasing bacterial load (saw blade). Contamination occurred by contact with raw materials and insufficient cleaning measures, as with transport containers, rough cutting board and saw blade.

The raw material did not meet current microbiological quality standards (median surface count 5.11 log CFU/cm^2). Contamination of freshly cut surfaces occurred via the equipment. Bacterial counts of machine-sawed surfaces of coarsely cut hind legs decreased slightly (from 2.91 to 2.69 log CFU/cm^2), while surface counts of finely cut-up hams (cut manually) increased from 4.0 to 4.5 log CFU/cm^2 in the course of processing. Because of increased handling, increased intensity of manual cutting resulted in increased surface cell counts in the order backfat – shoulder – finely cut up hams.

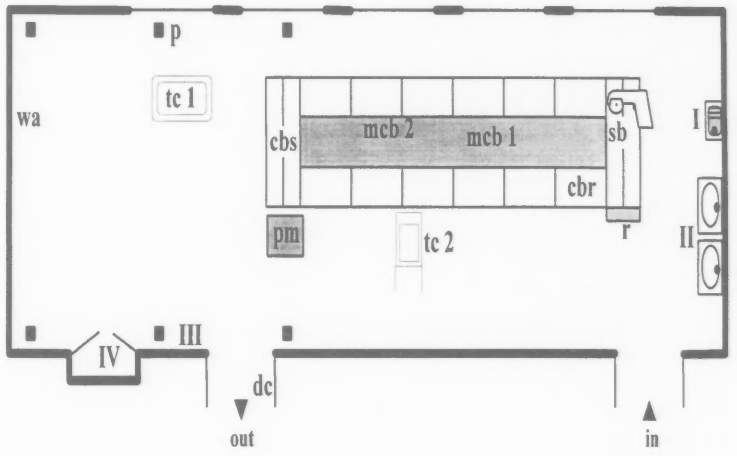
INTRODUCTION

Although animal tissues are internally sterile after slaughter, with a few exceptions, the tissue surfaces carry more or less heavy bacterial loads *(30)*. Composition and quantity of this surface contamination determine the safety and shelf life of fresh meat products.

Considering that an estimated one-fourth of the world's food supply is lost through microbial activity *(15)* and that 73 to 100% of European foodborne disease outbreaks with known etiology are caused by bacteria *(39)*, assuring satisfactorily low microbial contents of fresh meat surfaces has assumed increasing importance. As a consequence, during the past 20 years the European legislation has forced producers to adopt new strategies for consumer protection by establishing quality management, HACCP, or related systems. It has been reported, however, that along with their limitations of personnel, financial resources, and structural resources, small and medium sized plants may encounter more difficulties in complying with the new requirements than large-scale modern companies *(2, 37)*.

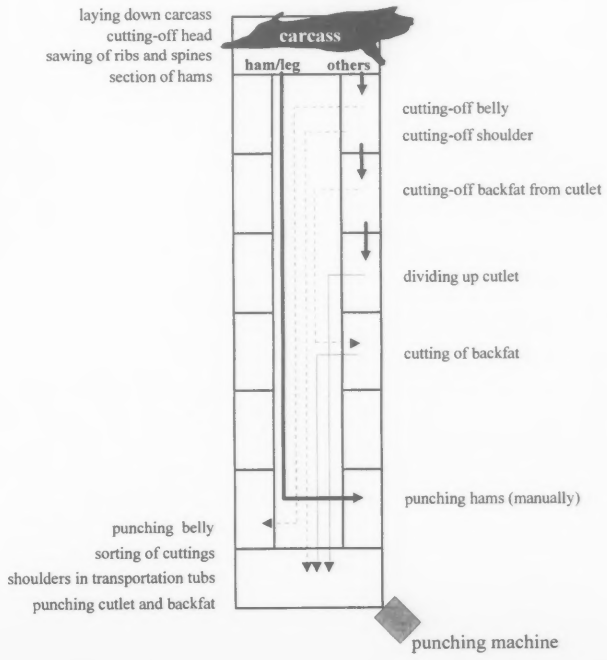
In Germany, the vast majority of the meat processing trade consists

Figure 1. Ground plan of the pork cutting room with company installations and sampling sites



r	roller	**cbr**	cutting board, rough	**I**	knife sterilization unit
sb	saw blade	**cbs**	cutting board, smooth	**II**	sink
pm	punching machine	**tc 1**	transportation container 1	**III**	temperature control unit
wa	wall	**tc 2**	transportation container 2	**IV**	cleaning material
p	post	**mcb 1**	meat conveyor belt, site 1		
dc	door cover	**mcb 2**	meat conveyor belt, site 2		

Figure 2. Rough cutting procedure for pig carcass halves and resulting meat cuts



of small-scale plants producing for the local market: In 1995, a total of 18,235 small-scale businesses with an average number of 11 employees (16,633 with fewer than 20 employees) were faced by 846 industrial meat processing plants with a median of 95 employees *(36)*. The smaller companies often have difficulties integrating requirements for improved hygiene into their daily routine, aside from the general difficulty of introducing more demanding quality management systems. The most frequent reasons for this are lack of knowledge *(35)*, inadequately trained personnel *(11)*, outdated premise structures *(41)*, and excessive work load *(30)*.

Therefore, the aim of this study was to determine the status quo of processing hygiene in a small-scale meat processing plant. The sources of contamination and further microbial spreading should be identified. However, because much information is available concerning the microbial quality of freshly slaughtered carcasses *(3, 13, 14, 17, 18, 21, 24, 31)*, a cutting and deboning company was chosen as a model. The microbial flora of the products at this processing stage reflects the previous history of the carcasses and the hygienic conditions under which the cutting and deboning operations are carried out *(16)*.

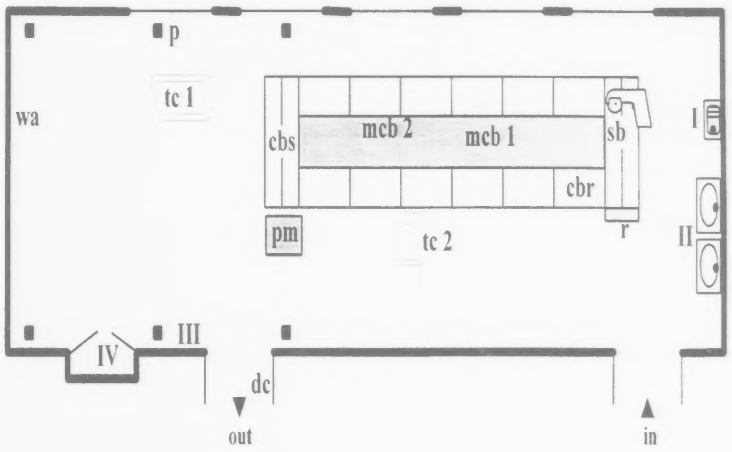
MATERIALS

Company

Structure and equipment. In the small-scale meat cutting and deboning company studied, a weekly throughput was about 3500 pig carcass halves. Its premises, built in 1967 were no longer compatible with EU requirements. For example, no truck docking station was available; unloading of trucks and hanging up of pig carcasses onto the transportation lane was done manually, and refrigeration of meat in the passageway between delivery ramp and cutting or chilling rooms was not possible.

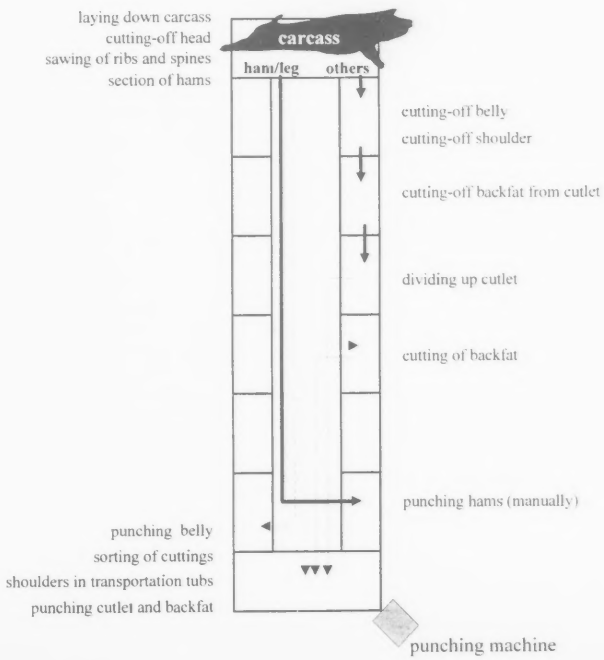
In the premise interior, the walls were tiled. Doors were closed by plastic door covers while processing was occurring and by metal slid-

Figure 1. Ground plan of the pork cutting room with company installations and sampling sites



r	roller	**cbr**	cutting board, raugh	**I**	knife sterilization unit
sb	saw blade	**cbs**	cutting board, smooth	**II**	sink
pm	punching machine	**tc 1**	transportation container 1	**III**	temperature central unit
wa	wall	**tc 2**	transportation container 2	**IV**	cleaning material
p	post	**mcb 1**	meat conveyor belt, site 1		
dc	door caver	**mcb 2**	meat conveyor belt, site 2		

Figure 2. Raugh cutting procedure for pig carcass halves and resulting meat cuts



of small-scale plants producing for the local market: In 1995, a total of 18,235 small-scale businesses with an average number of 11 employees (16,633 with fewer than 20 employees) were faced by 846 industrial meat processing plants with a median of 95 employees *(36)*. The smaller companies often have difficulties integrating requirements for improved hygiene into their daily routine, aside from the general difficulty of introducing more demanding quality management systems. The most frequent reasons for this are lack of knowledge *(35)*, inadequately trained personnel *(11)*, outdated premise structures *(41)*, and excessive work load *(30)*.

Therefore, the aim of this study was to determine the status quo of processing hygiene in a small-scale meat processing plant. The sources of contamination and further microbial spreading should be identified. However, because much information is available concerning the microbial quality of freshly slaughtered carcasses *(3, 13, 14, 17, 18, 21, 24, 31)*, a cutting and deboning company was chosen as a model. The microbial flora of the products at this processing stage reflects the previous history of the carcasses and the hygienic conditions under which the cutting and deboning operations are carried out *(16)*.

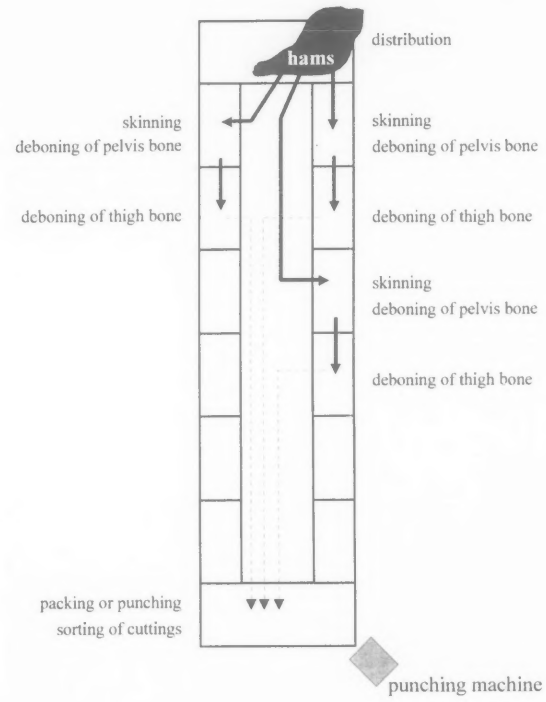
MATERIALS

Company

Structure and equipment. In the small-scale meat cutting and deboning company studied, a weekly throughput was about 3500 pig carcass halves. Its premises, built in 1967 were no longer compatible with EU requirements. For example, no truck docking station was available; unloading of trucks and hanging up of pig carcasses onto the transportation lane was done manually, and refrigeration of meat in the passageway between delivery ramp and cutting or chilling rooms was not possible.

In the premise interior, the walls were tiled. Doors were closed by plastic door covers while processing was occurring and by metal slid-

Figure 3. Fine cutting procedure for pig legs (hams) and resulting meat cuts



ing doors outside working hours. The transportation lane rested on galvanized posts. The cutting room (Fig. 1) was equipped with a metal meat conveyor belt surrounded by plastic cutting boards. At its head a roller that facilitated the placing of carcasses was fixed, and a circular saw was suspended from the ceiling. Sinks and knife sterilizers were also in this area. During working shifts, a mobile punching machine and several transportation containers (plastic and metal) were placed at the end of the conveyor belt. To enter the cutting room, passing through the cool storage areas for raw and for processed meat was unavoidable.

Sampling sites. In the course of the study, the saw blade of the circular saw, one cutting board with a rough and one with a smooth surface, two locations on the meat conveyor belt, the roller at the saw-table, the punching machine, two transportation containers, and three locations of the cutting room's interior (tiled wall, plastic door cover, and galvanized post of the transportation lane) were examined.

Personnel. The staff consisted of 10 to 12 mostly unskilled freelance workers paid by the piece. About half of them were of foreign origin and had more or less difficulty in understanding the German language. A personnel turnover rate of 75% was observed over the nine-month period of investigation.

Because of a high workload and lack of training activities in the company, hygiene awareness was low. For example, on several occasions it was observed that transport boxes were transferred from the floor directly onto the working surfaces, and some work surfaces were even climbed onto in order to close electrical connections.

Cleaning and disinfection measures. Cleaning of the cutting and deboning room was scheduled on Mondays and Wednesdays, cleaning and disinfection on Tuesdays, Thursdays and Fridays. In general, the measures were carried out by the company's own staff after to the cutting and deboning process. On Fridays, a special cleaning company was put in charge of cleaning and disinfecting the whole enterprise, including the cold storage areas. Cleaning was carried out with an 80 bar, 60°C high-pressure cleaning unit. The disinfectants used had been chosen according to agreement with the veterinary authority on the basis of product information.

Raw material

Delivery, handling and processing. After unloading, manual transport, weighing, and visual control, the delivered pig carcass halves were brought into the cold-storage area. Cutting and deboning started at about 10 p.m. and lasted until 9 a.m. the following day. On 28 working days, pig carcass halves were used as raw material for rough cutting, as shown in Fig. 2. On 11 days, the cutting and deboning process started with finely cutting-up legs (Fig. 3) obtained from the previous day's work.

Sampling Site. Pig carcass half and leg samples were both taken from the lateral hind leg rind 15 to 30 minutes before the cutting and deboning process.

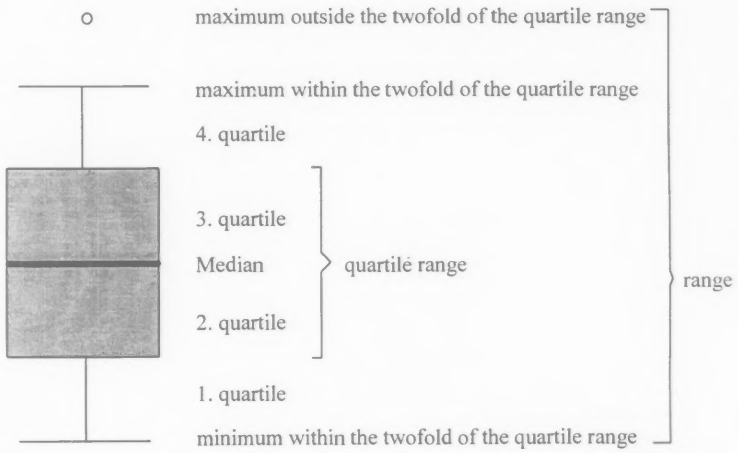
Meat cuts

Handling and processing. The processes of rough and fine cutting are shown in Fig. 2 and 3, respectively. With the exception of sawing of ribs and spines in rough cutting, all cuts were performed manually with knives.

Sampling sites. Sampling of meat cuts was carried out exclusively from freshly cut intersections. Immediately after the beginning of the working process, the first three cuts were examined. About two hours later, sampling was repeated on three similar cuts.

During rough cutting of carcass halves, sampling was carried out on the hind leg sections where the loin had been sawed off. The only contact with these fresh sections had been via the saw blade. In addition, further samples were taken from the cranial surface of sections of coarsely

Figure 4. Explanation of boxplot representation of colony counts



cut shoulders and from the inner part of backfat, both of which had been cut manually so that the freshly cut surface had been in contact with hands or steel mesh boning gloves, knives, cutting tables, and the conveyer belt. Samples from finely cut-up hams were taken from the medial thigh muscles after deboning. The contact surfaces were the same as mentioned for shoulders and backfat.

METHODS

Observations and measurements

Production was studied during 39 work shifts (9 Mondays, 7 Tuesdays, 7 Wednesdays, 7 Thursdays, 9 Fridays) between May 1992 and January 1993. The cutting and deboning process was observed for at least 90 minutes at the beginning and again after 2 hours with special attention to cleaning efficiency and processing hygiene. Additionally, on 5 occasions, the core temperatures in the *M. semitendinosus* of 5 randomly selected freshly administered pig carcass halves were measured with a Hygrotest 6200 (Testotherm, Lenzkirch, FRG).

Microbiological examination

A total of 407 meat surfaces (for sampling sites and number of samples per location, Table 1) were sampled destructively by removing a circular piece with sterile lancet and tweezers that had been marked with a cylindrical stainless steel knife. The pieces (diameter 19.6 cm, thickness about 1.0 cm) were transferred into stomacher 400 bags (Seward medical, London, GB) and stored for a maximum of 6 hours at 4°C.

Premise installations were sampled by the wet-dry double swab technique, which has been described recently in the German standard DIN 10113-1 *(7)*. Across 772 surface areas of 20.4 cm^2 marked by a sterile steel template, first, a moistened (with dilution fluid; see below) and subsequently a dry swab (50% cotton, 50% viscose; Medka KG, Berlin, FRG) was rubbed. Both swabs were put into an Erlenmeyer tube. As for meat samples, the maximum refrigerated storage time was 4 hours.

Meat samples were homogenized in the stomacher 400 (Seward Medical, London, GB) with 40.0 ml sterile 0.85% (w/v) aqueous sodium chloride (Merck 6404, Darmstadt, FRG) solution with 0.1% (w/v) peptone (Merck 7213, Darmstadt, FRG), and swab samples were soaked in 20.0 ml of the same solution with shaking on a laboratory shaker (Cenco, Breda, NL).

Serial dilutions were made from all samples to the third decimal dilution step.

Total aerobic cell counts (30 ± 1°C) and *Enterobacteriaceae* counts were performed on all samples by use of the drop plating method according to DIN 10161-2 *(8)* and DIN 10164-2 *(9)*, respectively. Plate count (PC) agar plates (Merck No. 5463, Darmstadt, FRG) and violet red bile glucose (VRBG) agar plates (Oxoid No. CM485, Basingstoke, GB) were divided into four sectors. On each sector, 0.05 ml of the sample homogenate or of the subsequent decimal dilutions were spread. Each sample was plated in parallel.

Both types of plates were incubated at 30°C; PC plates were cultivated aerobically for 72 hours and VRBG agar plates anaerobically for 48 hours.

Colony counts were computed according to the formula given in the previously mentioned DIN standards and transformed into logarithmic values. For statistical evaluation, distribution independent procedures were used and depicted as boxplots (for example, see Fig. 4). For comparison of two random samples, the Mann-Whitney test was used. For $P > 0.05$, both populations were regarded as similar; otherwise ($P \leq 0.05$), were considered different. Regression analysis was used to confirm linear relationships between values. Correlation coefficients close to -1.0 or 1.0 confirmed a linear relationship, whereas values close to 0 showed a lack of linearity.

RESULTS

Company installations

Results of the visual evaluation of cleanliness before the start of the working day as well as the total aerobic surface and *Enterobacteriaceae* counts of company installations, shown in Table 1, indicate that inadequately cleaned surfaces were encountered frequently on the premises. In particular, transport containers showed a sticky greyish surface film, even after being cleaned. Likewise, meat residues were often detected under the security covering of the circular saw. Plastic doors and transportation lane posts also deserve mention.

TABLE 1. Total aerobic surface counts (30 ± 1°C) and *Enterobacteriaceae* counts of company installations, working tools and meat (before and at start of the work day and after two hours of processing)

	Total aerobic counts (30±1°C)					*Enterobacteriaceae* counts	
	start (CFU/cm²)			after 2h (CFU/cm²)		start (CFU/cm²)	after 2h (CFU/cm²)
	N*	% v.u.**	med***	N	med	med	med
Installations and tools							
saw blade	38	39	3.94	39	2.70	1.30	<1.30
cutting unit							
roller at sawing table	33	24	3.87	32	4.13	<1.30	1.30
cutting board (rough)	39	15	4.86	39	5.11	2.61	2.83
cutting board (smooth)	39	8	3.56	39	4.53	1.30	2.30
meat conveyor belt (center)	39	8	3.58	39	4.28	<1.30	2.08
meat conveyor belt (margin)	38	8	3.06	39	4.08	<1.30	2.00
punching machine	34	18	2.86	30	3.96	<1.30	1.78
transportation containers							
transportation carts	36	86	5.46	32	5.33	1.81	2.46
transportation tubs	36	86	4.67	29	4.88	1.67	2.32
premise interior							
walls	18	22	2.76	16	3.04	<1.30	<1.30
posts of transportation lane	18	78	3.13	16	3.08	<1.30	<1.30
plastic doors	20	85	3.51	14	3.65	<1.30	<1.30
Meat							
lateral hind leg rind	117		5.11	0	-	2.65	-
coarsely cut up hams (cranial saw section)	82		2.91	81	2.69	<1.61	<1.61
finely cut up hams (medial thigh muscles)	32		4.02	32	4.59	2.08	2.45
coarsely cut shoulders (cranial cut section	0		-	33	4.20	-	2.49
backfat (inner part)	0		-	30	4.02	-	2.43

*N: total number of samples **v.u.: visually unclean ***med: median log CFU/cm²

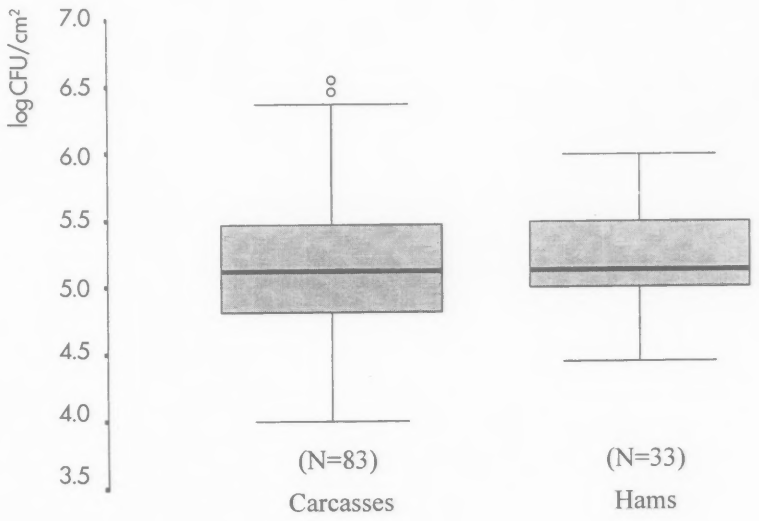
During cutting and deboning, four different aspects of surface bacterial load could be observed:

1. Increasing bacterial load. The total aerobic counts of nearly all cutting installations (smooth cutting board, conveyor belt, roller, punching machine) increased from about 3.4 log CFU/cm² (2.8 to 3.8 log CFU/cm²) prior to the start of working to a median value of about 4.2 log CFU/cm² (4.0 to 4.5 log CFU/cm²).
2. High bacterial level with no difference during working shift. At the start of work, the rough cutting board and the transportation containers already showed total aerobic counts of more than 5.0 log CFU/cm², which high level was maintained over the entire working day.
3. Low bacterial level with no difference during working shift. All locations of the premise interior (tiled wall, plastic door, galvanized post of the transportation lane) showed bacterial counts around 3.0 log CFU/cm² regardless of the time of sampling.

TABLE 2. Core temperatures of 5 randomly selected pig carcass hams measured upon delivery on 5 inspection days

Inspection day	Ham core temperatures (°C)				
	1	2	3	4	5
13	12.9	13.4	14.4	14.5	14.6
15	6.7	6.8	7.0	12.7	15.0
19	3.5	3.7	4.0	4.0	4.1
23	4.8	4.9	5.3	5.8	6.0
31	4.3	4.8	4.8	5.1	5.3

Figure 5. Total aerobic colony counts (Median, 1st to 4th quartile and values exceeding the double quartile range; see Figure 4) of lateral hind leg rinds of the raw material (pig carcass halves and roughly cut hams) prior to cutting and deboning



4. Decreasing bacterial load. The total aerobic counts of the blade of the circular saw varied considerably before work started, ranging from below the lower detection limit (1.3 log CFU/cm²) to above the upper detection limit (6.3 log CFU/cm²), with a median value of 3.94 log CFU/cm². Two hours later the median value had decreased by more than one log cycle, to 2.70 log CFU/cm². In addition, the range of results was reduced by more than 1 log cycle.

Raw material quality

Raw materials, i.e., pig carcasses, were delivered mainly by eight suppliers situated in northwestern and northeastern Germany. Excess demand was met by different suppliers throughout the European Union, so that information on the day of slaughter, the slaughter technology, and the duration of transportation could not be obtained.

Aerobic plate counts of carcass and leg rinds (Fig. 5) varied between 3.99 log CFU/cm² and more than 6.61 log CFU/cm², with a median of 5.11 log CFU/cm². The median *Enterobacteriaceae* count was 2.65 log CFU/cm² with a maximum of 4.94 log CFU/cm² and a minimum of less than 1.61 log CFU/cm². As shown in Fig. 5, the median values were similar for carcass rinds (5.12 log CFU/cm²) and leg rinds (5.08 log CFU/cm²), although the latter had been stored for at least one more day in cold storage. However, the range of aerobic counts for freshly delivered carcasses was nearly twice that of stored leg rinds.

The core hind leg temperatures at delivery, shown in Table 2 varied between 3.5°C and 15.0°C. Temperatures above 7°C were observed on 2 of 5 days.

In Figure 6, the total bacterial counts of the rind are shown for each day of the week. Carcasses delivered on Sunday and Monday evenings showed a slightly higher and more variable total aerobic as well as *Enterobacteriaceae* count. However, statistical evaluation of test results indicated that this difference was not statistically significant ($P > 0.05$).

Seasonal influences on the surface bacterial counts of carcass rinds could not be determined. The correlation coefficient between day temperatures (15 h) and bacterial load of the pig carcass rinds on delivery was -0.14.

Quality of meat cuts

Total aerobic counts on freshly cut meat surfaces 2 hours into the cutting and deboning process are shown in Table 1. Although the contamination level of all manually cut pieces was 4.0 log CFU/cm² or more

Figure 6. Tatal aerabic calany caunts (Median, 1st to 4th quartile and values exceeding the dauble quartile range; see Figure 4) af lateral hind leg rinds of the raw material (pig carcass halves and roughly cut hams) an different week days

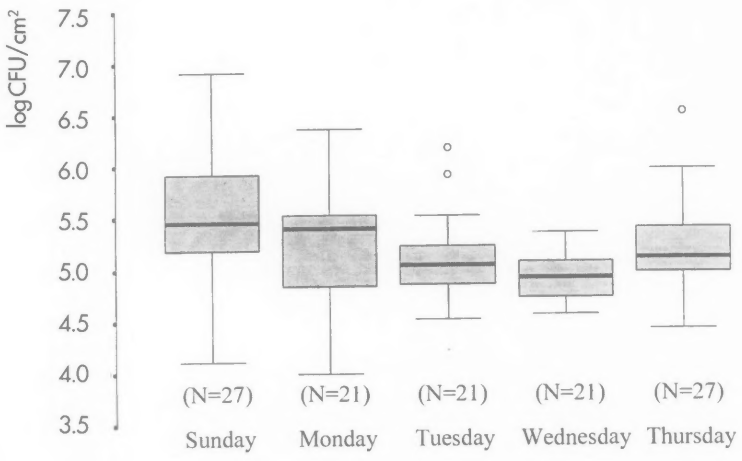
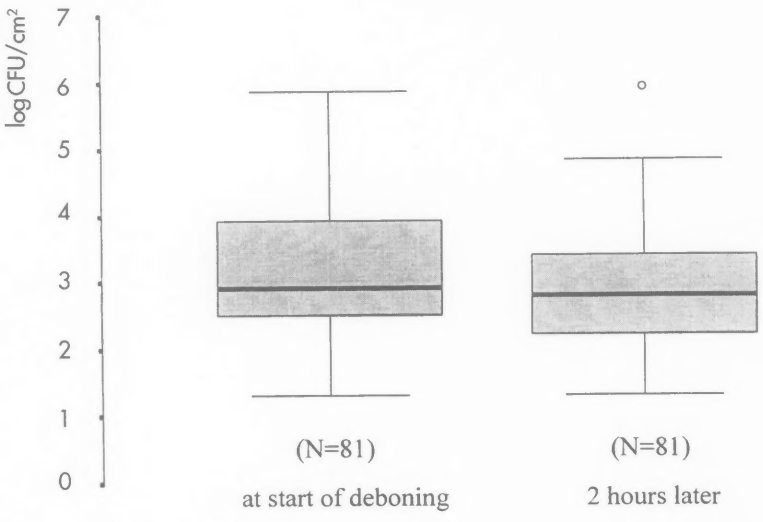


Figure 7. Tatal aerobic calany caunts (Median, 1st ta 4th quartile and values exceeding the double quartile range; see Figure 4) an the cranial sawing surfaces where the lain had been sawed aff during raugh cutting of the first hams after beginning af wark and af randamly selected hams after twa haurs



(finely cut hams, 4.50 log CFU/cm²; coarsely cut shoulders, 4.20 log CFU/cm²; backfat 4.02 log CFU/cm²), the bacterial load of the sawed surface of the coarsely cut hind legs was only 2.69 log CFU/cm².

Furthermore, the bacterial content of the latter had declined from 2.91 (initial samplings) to 2.69 log CFU/cm² (samples taken after two hours; see Fig. 7). Quartiles were comparable in both cases (0.87 and 0.88 log CFU/cm²). However, the differences between bacterial counts at the start of the working day and two hours later were not statistically significant ($P > 0.05$).

On the other hand, the total aerobic counts from finely cut hams increased from 4.02 log CFU/cm² to 4.50 log CFU/cm² (see Fig. 8), and were more variable at the beginning (quartile at working start = 1.5 log CFU/cm²; quartile after 2 hours = 1.1 log CFU/cm²). The order of the increase was the same on the cutting board (smooth surface) and the conveyer belt.

DISCUSSION

In discussing the contamination of fresh meat during processing, two parameters can be distinguished: the sources from which microorganisms originate and the way the original contamination is spread.

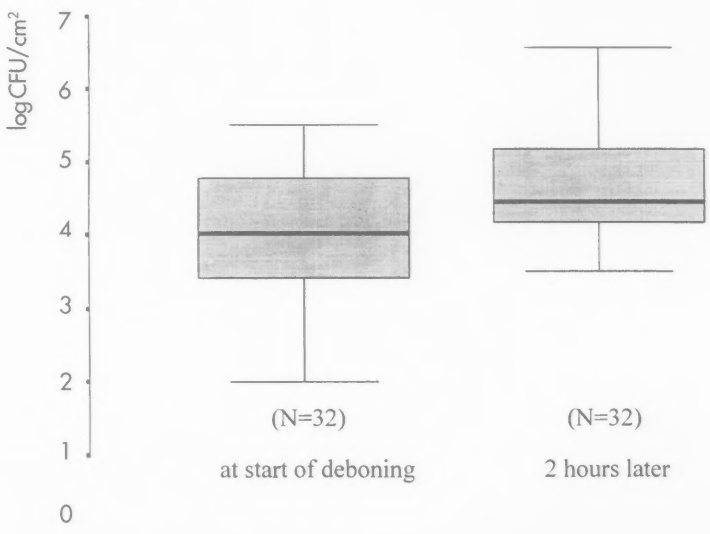
In general, the route of contamination was from the raw material (via company installations and working tools) onto fresh meat cuts. However, both raw materials (i.e., pig carcasses and coarsely cut-up hams), and working equipment were shown to be important sources of contamination, with their significance depending on the processing stage, the equipment item, and the meat surface under study.

Contamination of company installations and working tools

Cleaning and disinfection measures. Considering the fact that surface counts can be reduced by 8 to 9 log cycles per cm² *(29)*, cleaning and disinfection generally must be regarded as ineffective in the cutting and deboning establishment under study. Moreover, some critical points with above-average contamination levels could be identified.

Because of the high bacterial load of the rough cutting board before work started, the increase during processing amounted only to 0.3 log, which was 0.5 to 1.2 log cycles higher than on the smooth cutting board. Thus, along with an improved cleaning and disinfection program, frequent planning should be used to keep cutting boards in a smooth surface condition *(1)*.

Figure 8. Total aerobic colony counts on mediol thigh muscles of the first finely cut-up homs after beginning of work and of rondomly selected finely cut-up homs ofter two hours



In addition, sticky and hard-to-remove surface films and high level bacterial loads, reminiscent of biofilms described by Zottola and Sasahara *(43)* and by Genigeorgis *(10)*, were detected on the transportation containers. Although no significant increase occurred during contact with meat, a change in microbial composition was detected: *Enterobacteriaceae*, initially present in very low numbers, increased during processing to the same level as on the other meat contact installations. The lack of store- room space had prompted the company to store transportation containers in cold storage; consequently, the transportation containers were cleaned together with the cold storage areas, on Fridays only.

Other critical points with respect to cleaning efficiency were the circular saw and the plastic door cover. The saw was difficult to clean because of a security device that covered at least half of the saw blade at one side; the door cover was not cleaned because it was covered by metal sliding doors during the cleaning procedure.

To improve the efficiency of cleaning and disinfection, organizational structure of the process must be changed. First, cleaning and disinfection should be performed at the end of each working day *(28)* instead of on three out of five days, as in this case. Second, this work should be performed only by qualified personnel having cleaning and disinfection as their main task, not by ill-trained company-employed staff *(5)*. Third, the efficiency of the measures taken should be monitored *(5, 12)*. For this purpose, portable ATP-Bioluminescence systems, such as Hylite (Merck, Darmstadt, FRG) and P3-Clean Check (Henkel, Düsseldorf, FRG) allow for verification within a matter of minutes *(26, 27)*. Fourth, a feedback system should be established in which the results of the surveillance activities are reported to the cleaning personnel in order to improve their performances *(22)*.

Contamination due to raw materials. Normally, the microbial load of meat contact surfaces rises quickly to a certain level, after which no further increase occurs *(4, 20)*. In our study, this level was 4.0 to 4.5 log CFU/cm², similar to the data reported by Rühlmann and Feldhusen *(32)*. An important factor determining this magnitude is the bacterial load of the raw material *(16)*. Because rind samples in this study showed a contamination level, that was 0.7 log cycles higher, one may assume that the microbial count is reduced because of its distribution across equipment surfaces. The significance of the raw material as contamination sources was illustrated by the numbers of *Enterobacteriaceae*: Rarely detected on equipment before work had started, two hours later this microbial group was present on equipment in the same order of magnitude as on the raw material. Additionally, on surfaces without any regular meat contact (wall, transportation lane post, door), no change in the comparatively low bacterial load was detected.

In contrast, the blade of the circular saw showed decreasing total bacterial counts. High initial counts turned into the lowest bacterial counts compared with those of all other surfaces during processing, the result of sawing almost germ-free inner muscle or bone tissue.

To reduce the bacterial load on meat contact surfaces during working, the company should take frequent decontamination measures *(23)*. Cutting boards should be turned over or exchanged for clean ones *(6)*, and raw material and processed meat should be kept separate, i.e., there should be no transport on the same conveyor belt *(30)*.

Microbial quality of raw materials

Although seasonal variations in the microbial quality of the raw materials were not observed, total aerobic counts differed slightly with the day of week, being somewhat higher on Mondays and Tuesdays than during the rest of the week. This difference, which was not statistically significant, may be related to extended storage in as much as slaughter had taken place before the previous weekend in the case of raw materials used on Mondays and Tuesdays.

In general, the raw materials (median surface count 5.11 log CFU/cm²) did not meet modern microbial quality standard requirements. On carcass surfaces, total aerobic counts of less than 4.0 log CFU/cm² can be achieved before cutting *(6, 13, 16, 40)*. Furthermore, after overnight chilling, Gill and Bryant did not detect any *Enterobacteriaceae* on pig

carcasses *(13)*; however, in that investigation, the authors examined the carcass back region, which is not a typical region for fecal contamination *(42)*.

To improve microbiological quality, the raw material should be controlled. A temperature control on delivery should be installed, because random checks showed inner leg temperatures as high as 15°C. Furthermore, contractual microbiological standards to be met by the suppliers should be set or bacteriological controls should be accomplished in the plant itself. For the latter purpose, several test kits based on ATP-bioluminescence, such as 'CellScan' (ConCell, Venlo, NL), and 'Bio-counter' (Zelsis-Lumac B.V., Landgraaf, NL), have recently become commercially available in Europe. The benefits of tests based on this technique for the classification of pig carcasses on delivery were reported recently *(38)*.

Contamination of cutting surfaces on fresh meat

After a two-hour cutting and deboning period, total aerobic counts exceeding 4.0 log CFU/cm^2 were found on most cutting surfaces. As for the raw material, the bacterial loads were rather high by modern standards. Counts below 3.0 log CFU/cm^2 can be achieved easily *(40)*. The microbial quality of retail cuts seems to depend primarily on the contamination level of the contact surfaces and to only a minor degree on the initial microbial population on carcass surfaces *(25)*. For example, cutting boards have been noted to be significant contamination source *(6, 33)*. Therefore, a 100-fold reduction of the bacterial load can be achieved merely by paying attention to hygiene measures *(40)*.

In our study, insufficient cleaning and disinfection of the saw blade resulted in higher surface counts of coarsely cut up hams than counts obtained two hours later. The opposite effect was observed with finely cut up hams. Freshly cut surfaces showed lower bacterial counts at the beginning than after two hours, because of increasing bacterial loads on the equipment.

Differences in contamination magnitude between meat cuts can be attributed to difference in the processing procedure, i.e., to mechanical or manual treatment, as well as to differences in the extent of handling. Again, the low bacterial counts of mechanically sawed hams after two hours and the relatively high counts on manually prepared sections of finely cut hams can be mentioned. However, according to reports in other publications, in manually processed meat cuts, differences due to increased handling intensity could also be detected *(16, 33, 34)*. The median contamination level rose by 0.2 log cycles from backfat to coarsely cut shoulders to finely cut hams.

CONCLUSIONS

In the meat processing plant studied, several measures were necessary to reduce the high microbial loads. First, cleaning and disinfection measures had to be improved. A problem to be solved by the company's management is maintenance of a high level of hygienic awareness among the staff; a high rate of employee turnover makes this goal difficult to achieve.

Apart from existing differences between different plants and different countries, adherence to basic hygiene principles during processing may already represent a problem for small-scale meat processors. Even if the meat processing plant under study was not representative of most meat processing facilities in Germany, introduction and application of more demanding control systems, such as HACCP plans, in small-scale meat processing plants, as suggested by Aramouni et al. and Kukay et al., may encounter serious difficulties *(2, 19)*.

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REFERENCES

1. Ak, N. O., D. O. Cliver, and C. W. Kaspar. 1994. Decontamination of plastic and wooden cutting boards for kitchen use. J. Food Prot. 57:23–30.
2. Aramouni, F. M., E. A. E. Boyle, and L. R. Vogt. 1996. Introduction to the hazard analysis critical control point (HACCP) concept in a small meat-processing plan. Dairy Food Environ. Sanit. 16:431–439.
3. Bell, R. G. 1997. Distribution and sources of microbial contamination on beef carcasses. J. Appl. Microbiol. 82:292–300.
4. Burt, S. A., and M. H. Hinton (ed.), 1996. Concerted action CT94-1456. Microbial control in the meat industry, Vol. 5. Cleaning and disinfection of equipment and premises. University of Bristol Press, Bristol, United Kingdom.
5. Berends, B., S. Burt, and J. Snijders. 1995. Critical points in relation to breaking *Salmonella* and *Listeria* cycles in pork production, p. 9-20. *In* S. A. Burt and F. Bauer (ed.), New challenges in meat hygiene: Specific problems in cleaning and disinfection. ECCEAMST-Foundation, Utrecht, The Netherlands.
6. Coates, K. J., J. C. Beattie, I. R. Morgan, and P. R. Widders. 1995. The contribution of carcass contamination and the boning process to microbial spoilage of aerobically stored pork. Food Microbiol. 12:49–54.
7. DIN 10113-1. 1997. Bestimmung des Oberflächenkeimgehaltes auf Einrichtungs- und Bedarfsgegenständen – Teil 1: Quantitatives Tupferverfahren (Referenzverfahren). Beuth-Verlag, Berlin, Germany.
8. DIN 10161-2. 1984. Bestimmung der aeroben Keimzahl bei 30°C in Fleisch und Fleischerzeugnissen, Tropfplattenverfahren. Beuth-Verlag, Berlin, Germany.
9. DIN 10164-2. 1986. Bestimmung von Enterobacteriaceae in Fleisch, Tropfplattenverfahren Beuth-Verlag, Berlin, Germany.

10. Genigeorgis, C. 1995. Biofilms: Their significance to cleaning in the meat sector, p. 29-49. *In* S. A. Burt and F. Bauer (ed.), New challenges in meat hygiene: Specific problems in cleaning and disinfection. ECCE-AMST-Foundation, Utrecht, The Netherlands.
11. Gerats, G. E. 1996. Short and long-term quality assurance strategies; changing the management's attitudes, p. 41-56. *In* F. J. M. Smulders and M. J. B. M. Weijtens, (ed), Meat training for Europe; making training effective. ECCEAMST Foundation, Utrecht, The Netherlands.
12. Gerstein, J., R. Orth, and J. Baumgart. 1993. Reinigungs- und Desinfektionsmaßnahmen; Mikrobiologische Bewertung im Bereich der Zerlegeabteilung eines Fleischwarenbetriebes (Cleaning and disinfection measures; microbiological evaluation in the cutting and deboning department of a meat processing company). Fleischwirtschaft 73: 740–744
13. Gill, C. O., and J. Bryant. 1992. The contamination of pork with spoilage bacteria during commercial dressing, chilling and cutting of pig carcasses. Int. J. Food Microbiol. 16:51-62.
14. Grau, F. 1979. Fresh Meats: Bacterial Association. Arch. Lebensmittelhyg. 30:87-92.
15. Huis in't Veld, J. H. J. 1996. Microbial and biochemical spoilage of foods: An overview. Int. J. Food Microbiol. 33:1-18.
16. ICMSF. 1998. Microorganisms in foods. 6: Microbial ecology of food commodities. Blackie Academic & Professional, London.
17. Ingram, M., and T. A. Roberts. 1976. The Microbiology of the red meat carcass and the slaughterhouse. Royal Soc. Health J. 96:270-276.
18. Johanson, L., B. Underdal, K. Grøsland, O. P. Whelehan, and T. A. Roberts. 1983. A survey of the hygienic quality of beef and pork carcasses in Norway. Acta vet. scand. 24:1-13.
19. Kukay, C. C., L. H. Holcomb, J. N. Sofos, J. B. Morgan, J. D. Tatum, R. P. Clayton and G. C. Smith. 1996. Application of HACCP by small-scale and medium-scale meat processors. Dairy Food Environ. Sanit. 16:74-80.
20. Kusch, D. 1977. Ein Beitrag zur Hygienekontrolle in fleischverarbeitenden Betrieben (A contribution to hygiene control in meat processing plants). Arch. Lebensmittelhyg. 28:68-72.
21. Mukartini, S., C. Jehne, B. Shay, and C. M. L. Harper. 1995. Microbiological status of beef carcass meat in Indonesia. J. Food Safety 15:291-303.
22. Musah, M. A. 1993. Proving the suitability of three sampling methods for the evaluation of cleaning and disinfection in a slaughterhouse. Master's thesis, Free Univ., Fac. vet. med., Berlin, FRG.
23. Nortjé, G. L., L. Nel, E. Jordaan, R. T. Naudé, W. H. Holzapfel and R. J. Grimbeek. 1989a. A microbiological survey of fresh meat in the supermarket trade. Part 1: Carcasses and contact surfaces. Meat Sci. 25:81-97.
24. Nottingham, P. M. 1982. Microbiology of carcass meats, p. 13-65. *In* M. H. Brown (ed.), Meat Microbiology. Applied Science Publishers, London, United Kingdom.
25. Nortjé, G. L., L. Nel, E. Jordaan, R. T. Naudé, W. H. Holzapfel, and R. J. Grimbeek. 1989b. A microbiological survey of fresh meat in the supermarket trade. Part 2: Beef retail cuts. Meat Sci. 25:99-112.
26. Orth, R., and M. Steigert. 1996. Hygiene monitoring; practical experience in the ATP-biolominescence measuring method to control hygiene after cleaning of a meat processing plant. Fleischwirtschaft 76:1143-1144.
27. Poulis, J. A., M. de Pijper, D. A. A. Mossel, and P. P. A. Dekkers. 1993. Assessment of cleaning and disinfecton in the food industry with the rapid ATP-bioluminescence technique combined with the tissue fluid contamination test and a conventional microbiological method. Int. J. Food Microbiol. 20:109-116.
28. Reuter, G. 1984. Reinigung und Desinfektion in der Lebensmittel hygiene. Fleischwirtschaft 64:668-674.
29. Reuter, G. 1995. Factors influencing the efficacy of cleaning and disinfection in meat processing, p. 11-27. *In* S. A. Burt (ed.), Cleaning and disinfection technologies in the meat industry. ECCEAMST Foundation, Utrecht, The Netherlands.
30. Reuter, G. 1996. Mikrobiologie des Fleisches, p. 3-115. *In* H. Weber, (ed.), Mikrobiologie der Lebensmittel, Fleisch und Fleischerzeugnisse (microbiology of food, meat and meat products). Behr's, Hamburg, Germany.
31. Roberts, T. A., W. R. Hudson, O. P. Whelehan, B. Simonsen, K. Olgaard, H. Labots, J. M. A. Snijders, J. Van Hoof, J. Debevere, J. F. Dempster, J. Devereux, L. Leistner, H. Gehra, J. Gledel, and J. Fournaud. 1984. Number and distribution of bacteria on some beef carcasses at selected abattoirs in some member states of the European Communities. Meat Sci. 11:191-205.
32. Rühlmann, S. and F. Feldhusen. 1996. Studies into the suitability of different non-destructive sampling methods applicated to various materials. Fleischwirtschaft 76:843-845 and 1048.
33. Sheridan, J. J., B. Lynch and D. Harrington. 1992. The effect of boning and plant cleaning on the contamination of beef cuts in a commercial boning hall. Meat Sci. 32:185-194.
34. Smulders, F. J. M., and G. Eikelenboom. 1987. Accelerated meat processing; microbiological aspects, p. 79-93. *In* A. Romita, C. Valin, and A. A. Taylor (eds.), Accelerated processing of meat. Elsevier applied science, London, United Kingdom.
35. Smulders, F. J. M. and R. L. J. M. van Laack. 1992. On the quality of pork. 1. Microbiological concerns. Fleischwirtschaft 72:888-891.
36. Statistisches Bundesamt. 1998. Personal communication. Wiesbaden, Germany.
37. Stevenson, K. E. 1990. Implementing HACCP in the Food Industry. Food Technol. 44(5):179-180.
38. Tholen, R. 1997. Application of ATP-bioluminescence for the assessment of microbial contamination of raw meat with inspection by attributes. Thesis, University of Zürich, Fac. vet. med., Zürich, Switzerland.
39. Todd, E. C. D. 1997. Epidemiology of foodborne diseases: A worldwide review. World Health Statistics Quarterly 50:30-50.
40. Troeger, K., and K. O. Honikel. 1994. Erhöhung des Hygienestandards bei der Fleischgewinnung und -behandlung durch Prüfung nach CMA-Kriterien (Improving hygiene standard at meat production and treatment by inspection according to CMA criteria), p. 303-311. *In* Proc. 35. Arbeitstagung der DVG, Teil 1, 27.-30.09.1994 Garmisch Partenkirchen, Germany.
41. Upmann, M. 1996. The microbial contamination of pork surfaces before and after the cutting process as well as observations concerning working hygiene and ist monitoring with the wet-dry double swab technique. Thesis, Free Univ., Fac. vet. med., Berlin, Germany.
42. Woltering, B. 1990. Changes in the bacteriological condition of pig skin surfaces during cold-storage in different relative humidities. Thesis, Hanover School of Veterinary Medicine, Hanover, Germany.
43. Zottola, E. A., and K. C. Sasahara. 1994. Microbial biofilms in the food processing industry – Should they be a concern? Int. J. Food Microbiol. 23:125-148.

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Survival and Growth of *Escherichia coli* O157:H7 on Broccoli, Cucumber, and Green Pepper

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SUMMARY

The objective was to observe the growth pattern of a mixed culture containing three strains of *Escherichia coli* O157:H7 inoculated onto broccoli, cucumbers, and green peppers. Produce was inoculated at a high level (10^6 CFU/g), and a low level (10^3 CFU/g). After inoculation, whole and chopped produce was held at 15°C for 7 days or at 4°C for 14 days. Chopped vegetables at 4°C were held on ice to simulate salad bar conditions. In most cases, *E. coli* O157:H7 populations did not change on inoculated whole broccoli, whole cucumbers, and whole green peppers stored at 15°C for 7 days. In contrast, *E. coli* O157:H7 populations decreased by 2 log units on whole broccoli, cucumbers, and green peppers stored at 4°C. At both inoculum levels, a 2 log unit reduction in *E. coli* O157:H7 was noted for chopped green peppers held at 4°C. Populations of *E. coli* O157:H7 decreased by less than 1 log unit on the high-inoculum-level sliced cucumber; however, at the low inoculum level, the microorganism was reduced to undetectable levels on sliced cucumber. At 15°C, *E. coli* O157:H7 populations increased by 3 log units on sliced cucumbers stored for 7 days. Results indicate that *E. coli* O157:H7 can survive on produce held at 4°C and maintain initial levels or grow at 15°C.

INTRODUCTION

Although outbreaks of gastroenteritis caused by ingestion of fruits and vegetables are less frequent than those caused by other contaminated or improperly prepared foods *(6)*, the consumption of fresh fruits and vegetables has resulted in a number of recent foodborne illness outbreaks of gastroenteritis. Two outbreaks of foodborne illness have been attributed to the consumption of lettuce contaminated with *Shigella sonnei (9, 12)*. Ries et al. *(13)* described foodborne illness attributed to surface contamination of melons with *Salmonella chester;* the outbreak involved 25,000 people in 30 states and resulted in two deaths. Epidemiologic evidence implicated cantaloupe contaminated with *Salmonella poona* in a reported foodborne illness that occurred in 1991 *(7)*. Watermelon has been associated with three outbreaks of salmonellosis in the United States *(5, 11, 15)* and in another outbreak of salmonellosis, contaminated tomatoes were implicated *(16)*.

Cieslak et al. *(8)* reported an *E. coli* O157:H7 infection that resulted in four identified cases and

one death, an outbreak that was attributed to the consumption of inadequately washed vegetables from a manured garden and further person-to-person transmission. *E. coli* O157:H7 was the implicated organism in a foodborne illness outbreak in Massachusetts in which fresh-pressed apple cider was the initial vehicle of transmission and there was evidence of further person-to-person transmission through household contact *(4)*.

The potential for fruits and vegetables to become contaminated with pathogenic microorganisms can be high because of exposure of these foods to a wide variety of conditions during growth, harvest, and distribution.

Because salad bars are common in restaurants and grocery store deli sections, salad ingredients may serve as vehicles for pathogens. Albrecht et al. *(3)* reported abusive temperature conditions in commercial deli operations such that pathogens contaminating the vegetables could grow. Preparation practices such as cutting of surface-contaminated vegetables could result in microbial contamination throughout a prepared vegetable *(2, 10)*. The presence of non-enterohemorrhagic *E. coli* on the rind surface of watermelon and subsequently in the juices of the same watermelon has been reported *(1)*.

The objectives of this study were, first, to determine the growth and survival characteristics of *E. coli* O157:H7 on the surface of fresh broccoli, cucumbers, and green peppers, and, second to simulate salad bar preparation and holding practices with previously inoculated broccoli, cucumbers, and green peppers and further observe the survival and growth characteristics of *E. coli* O157:H7 on these foods.

MATERIALS AND METHODS

Strains and preparation of inocula

Three strains of *E. coli* O157:H7 were studied: N-4043, a human isolate from the Wisconsin Food Research Institute; MF1847, a beef isolate from the FSIS-USDA; and 933, a beef isolate from Rodney Moxley, Vet Diagnostic Center, University of Nebraska-Lincoln. Individual frozen stock cultures of each strain were activated by transfer to brain heart infusion broth (Difco, Detroit, MI) and incubation for 22 to 24 hours at 35°C. Equal numbers of each strain were used to prepare the inocula. Appropriate dilutions of each culture were placed into buffered peptone water (Becton Dickinson, Cockeysville, MD) to achieve a high inoculum level (10^6 CFU/ml) and a low inoculum level (10^3 CFU/ml).

Sample collection and preparation

Cucumbers, green peppers, and broccoli were obtained from a local fruit and vegetable distributor. For each vegetable, two replications were done during a 6-week period, for a total of 18 weeks. Vegetables were gently washed under running warm water for 2 minutes and allowed to drain on paper towels to simulate salad bar produce preparation techniques. Inoculation followed immediately. *E. coli* O157:H7 was not detected on the non-inoculated produce.

Sample inoculation

Cucumbers and green peppers were inoculated whole, four at a time, with sterile tongs used to place them in the 4l of inoculum. The vegetables were gently mixed in the inoculum for one min. They were then removed and allowed to drain for one min before being placed into plastic weigh boats for holding at either 4°C or 15°C to simulate salad bar holding practices. Five inoculated cucumbers were placed on a sterile cutting board and sliced, the slices were placed in a sterile bowl and mixed, and 25g portions were transferred to plastic weigh boats for holding at either 4°C or 15°C. The same procedure was followed for green peppers, except that seven inoculated peppers were chopped and placed in a sterile bowl. Broccoli was inoculated in the form of florets; washed broccoli heads were chopped on a sterile cutting board and the florets were placed in a sterile basket and gently mixed in the inoculum solution for one min, after which they were removed and allowed to drain for one min. Inoculated florets were placed in a sterile bowl and mixed before 25g portions were transferred to plastic weigh boats to be held at either 4°C or 15°C. The procedures described were followed for both the low level and the high level inoculum; the procedure with the low level inoculum always preceded the procedure with the high level inoculum. Chopped samples at 4°C were held on ice to simulate salad bar procedures. Previous research in this laboratory indicated that the 15°C incubation temperature simulated commercial salad bar temperatures *(3)*. Uninoculated whole broccoli, whole and sliced cucumbers, and whole and sliced green peppers were held under the same conditions as inoculated vegetables.

Organism enumeration

Samples held at 4°C were selected for analysis on days 0, 3, 7, 10, and 14. Samples held at 15°C were selected for analysis on days 0, 3, and 7. Four whole samples and four sliced samples were selected from each temperature level at each inoculum level for analysis. Whole samples were placed in a plastic stomacher bag with 100ml phosphate buffer and gently washed for 2 min. Serial dilutions of the buffer were plated onto sorbitol MacConkey's agar (SMA) (Oxoid, Hampshire, England) with 4 methylumbelliferone d-glucuronide (MUG) (Oxoid, Hampshire, England) and incubated 22-24 hours at 35°C. Sliced samples were weighed, placed in a sterile stomacher bag with an appropriate amount of phosphate buffer to achieve a 10^{-1} dilution, and pummeled by a commercial stomacher machine (Stomacher 400, Tekmar Company, Cincinnati, OH) for two min. Serial dilutions of the buffer were plated onto SMA/MUG agar and incubated for 22 to 24 h at 35°C. A 5-ml aliquot of slurry from each sample was placed into 25ml EC medium with novobiocin, and the

TABLE 1. Presence of *E. coli* O157:H7 detected on produce at 4 C and 15 C with high inoculum level (10^6 CFU/ml)

	4°C					15°C		
Vegetable	Day 0	Day 3	Day 7	Day 10	Day 14	Day 0	Day 3	Day 7
Broccoli (CFU/g)	5.3a	4.4b	3.8c	3.5c	2.9d	5.3a	5.5a	5.6a
Cucumbers Whole (CFU/ml)	5.7a	4.8b	4.1c	3.6d	3.6d	5.7a	5.2a	5.6a
Sliced (CFU/g)	4.0a	3.6a	3.9a	3.8a	3.4a	4.0a	5.0b	7.2c
Peppers Whole (CFU/ml)	5.4a	4.3b	3.8b	2.9c	3.1c	5.4a	5.0a	5.5a
Chopped (CFU/g)	4.3a	3.5b	2.4c	(+)[1]d	(+)d	4.3b	5.7a	5.5a

[1](+/-) value indicates *E. coli* O157:H7 presence (+) or absence (-) after enrichment.

a-d Within each temperature, values in each row with a different letter were significantly different ($P<0.05$).

mixture was at 35°C for 22 to 24 h. If a count could not be obtained on a sample, serial dilutions were made from the EC medium with novobiocin and plated onto SMA/MUG agar and incubated 22 to 24 h at 35°C to ascertain the presence of *E. coli* O157:H7. A representative sample of colonies counted were tested using an *E. coli* O157:H7 latex agglutination assay (Oxoid, Hampshire, England) to confirm *E. coli* O157:H7 presence.

Statistical analysis

Two replications of each vegetable type were completed. Data were analyzed using a variation of a split-plot model design with analysis of variance (ANOVA) and Least Square Means *(14)*. Differences between means were considered significant if $P<0.05$.

RESULTS

Current produce preparation and holding practices for salad bar use include washing under water, chopping, holding on ice for service, and holding in refrigerator units for longer-term use. Albrecht et al. *(3)* noted that commercially prepared salad ingredients were held at temperatures ranging from 5.1°C to 18.9°C, in contrast to the recommended 4°C. Our results indicate that *E. coli* O157:H7 can survive on the surface of broccoli, cucumber, and green pepper at both 4°C and 15°C. With inoculated chopped cucumber (at the high inoculum level) and green peppers (at both the high and low inoculum levels), *E. coli* populations increased during the storage period.

Broccoli

At the high inoculum level, *E. coli* O157:H7 populations decreased significantly (by 2 log units) on broccoli held at 4°C (Table 1). *E. coli* O157:H7 populations did not change significantly at the high inoculum level on broccoli held at 15°C (Table 1). *E. coli* O157:H7 at the low inoculum level was detected on broccoli held at both 4°C and 15°C on all days sampled (Table 2).

Cucumbers

E. coli O157:H7 populations at the high inoculum level on whole cucumbers held at 4°C decreased significantly from day 0 through day 10, although no change was observed between days 10 and 14, with a 2 log unit decrease over time (Table 1). At 15°C, *E. coli* O157:H7

TABLE 2. Presence of *E. coli* O157:H7 detected on produce at 4 C and 15 C with low inoculum level (10^3 CFU/ml)

	4°C					15°C		
Vegetable	Day 0	Day 3	Day 7	Day 10	Day 14	Day 0	Day 3	Day 7
Broccoli (CFU/g)	3.1a	2.9a	(+)[1]b	(+)b	(+)b	3.1a	3.4a	3.1a
Cucumbers Whole (CFU/ml)	2.9a	0.3b	(+)b	(-)b	(-)b	2.9a	3.0a	3.4a
Sliced (CFU/g)	3.8a	1.2b	2.4c	(-)b	(-)b	3.8a	5.0b	7.0c
Peppers Whole (CFU/ml)	2.9a	1.9b	(+)b	(+)b	(+)b	2.9a	(+)b	(+)b
Chopped (CFU/g)	1.9a	1.9a	(+)b	(+)b	(+)b	1.9a	2.0a	(+)b

[1](+/-) value indicates *E. coli* O157:H7 presence (+) or absence (-) after enrichment.

a-c Within each temperature, values in each row with a different letter were significantly different ($P<0.05$).

populations on whole cucumbers with the high inoculum level did not change over 7 days (Table 1). At the high inoculum level, *E. coli* O157:H7 populations were unchanged on sliced cucumbers held at 4°C, (Table 1), but increased significantly on sliced cucumbers held at 15°C for 7 days.

At the low inoculum level, *E. coli* O157:H7 was not detected on days 10 and 14 on either whole or sliced cucumbers held at 4°C (Table 2) but was detected through day 7 on both whole and sliced cucumbers held at 15°C (Table 2).

Green Peppers

At the high inoculum level, *E. coli* O157:H7 populations on whole peppers decreased significantly between days 0 and 3 but did not change over the storage period at 15°C (Table 1). At the high inoculum level, a significant decrease in *E. coli* O157:H7 populations was observed from day 0 through day 7 on chopped peppers held at 4°C, but an overall significant increase ($P<0.01$) of *E. coli* O157:H7 populations was observed from day 0 to day 7 on chopped peppers held at 15°C (Table 1).

At the low inoculum level, *E. coli* O157:H7 was detected on both whole and chopped peppers held at either 4°C or 15°C (Table 2) despite significant population decreases at both temperatures.

DISCUSSION

For the whole vegetables, with the high inoculum level treatment and at 40°C, *E. coli* O157: H7 populations decreased at 4°C with low inoculum level treatment, *E. coli* O157:H7 populations decreased for both whole and chopped vegetables.

One explanation for these decreases in *E. coli* O157:H7 populations may be the competitive flora naturally found on vegetables. At 15°C, for whole vegetable with the high inoculum level treatment, no decreases in *E. coli* O157:H7 populations were found. For whole broccoli and cucumber with the low inoculum level treatment at 15°C, no decreases in *E. coli* O157:H7 populations were found, although a decrease was found for whole pepper. For whole cucumber and pepper, the peel also acts as a barrier for the growth of *E. coli* O157:H7.

E. coli O157:H7 was able to grow on sliced cucumbers (high and low inoculum treatments) held at 15°C but not on whole cucumbers under the same conditions. The difference could be attributed to differences in moisture and nutrient availability. For sliced cucumber with the high inoculum level treatment,

E. coli O157:H7 population was maintained at 4°C because *E. coli* O157:H7 does not grow at 4°C. At the low inoculum level and at 4°C, *E. coli* O157:H7 was not detected in chopped cucumber after 10 days. This may be due to the small number of *E. coli* O157:H7 transferred to the internal flesh of the cucumber and the inability of *E. coli* O157:H7 to grow at 4°C.

With the high inoculum level, *E. coli* O157:H7 populations were maintained for whole peppers and increase for chopped peppers held at 15°C. However, at 4°C, *E. coli* O157:H7 populations decreased approximately 2 log units for both inoculum levels. This decrease could indicate the presence of inhibitory compounds in green pepper.

CONCLUSIONS

If *E. coli* O157:H7 is present on the surface and if vegetables are held at abusive temperatures, the microorganisms will remain on the vegetable unless other treatments are used to reduce their number. *E. coli* O157:H7 was able to grow on sliced cucumber at an abusive temperature (15°C); therefore, preparation practices such as proper washing of the cucumber and adequate refrigeration and storage must be followed.

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REFERENCES

1. Abbey, S. D., E. K. Heaton, D. A. Golden, and L. R. Beuchat. 1988. Microbiological and sensory quality changes in unwrapped and wrapped sliced watermelon. J. Food Prot. 51:531–533.
2. Abdul-Raouf, U. M., L. R. Beuchat, and M. S. Ammar. 1993. Survival and growth of *Escherichia coli* O157:H7 on salad vegetables. Appl. Environ. Microbiol. 59:1999–2006.
3. Albrecht, J. A., F. L. Hamouz, S. S. Sumner, and V. Melch. 1995. A Research Note: Microbial evaluation of vegetable ingredients in salad bars. J. Food Prot. 58:683–685.
4. Besser, R. E., S. M. Lett, J. T. Weber, M. P. Doyle, T. J. Barrett, J. G. Wells, and P. M. Griffin. 1993. An outbreak of diarrhea and hemolytic uremia syndrome from *Escherichia coli* O157:H7 in fresh-pressed apple cider. J.A.M.A. 269:2217–2220.
5. Centers for Disease Control. 1979. *Salmonella oranienburg* gastroenteritis associated with consumption of precut watermelons. Morbid. Mortal. Weekly Rep. 28:522–523.
6. Centers for Disease Control. 1990. Foodborne disease outbreaks, 5-year summary. 1983–1987. *In* CDC surveillance summaries, March, 1990. Morbid. Mortal. Weekly Rep. 39 (SS-1):15–57.
7. Centers for Disease Control. 1991. Multi-state outbreak of *Salmonella poona* infections–United States and Canada. 1991. Morbid. Mortal. Weekly Rep. 40:549–552.
8. Cieslak, P. R., T. J. Barrett, P. M. Griffin, K. F. Gensheimer, G. Beckett, J. Buffington, and M. G. Smith. 1993. *Escherichia coli* O157:H7 infection from a manured garden. Lancet. ii:367.
9. Davis, H., J. P. Taylor, J. N. Perdue, G. N. Stellma, Jr., J. M. Humphreys Jr., R. Rowntree III, and K. D. Greene. 1988. A shigellosis outbreak traced to commercially distributed shredded lettuce. Am. J. Epidemiol. 128: 1312–1321.
10. Del Rosario, B. A., and L. R. Beuchat. 1995. Survival and growth of enterohemorrhagic *Escherichia coli* O157:H7 in cantaloupe and watermelon. J. Food Prot. 58:105–107.
11. Gaylor, G. E., R. A. MacCready, J. P. Reardon, and B. F. McKernan. 1955. An outbreak of salmonellosis traced to watermelon. Public Health Rep. 70:311–313.
12. Martin, D. L., T. L. Gustafson, J. W. Pelosi, L. Suarez and G. V. Pierce. 1986. Contaminated produce–a common source for two outbreaks of *Shigella* gastroenteritis. Am J. Epidemiol. 124:299–305.
13. Ries, A. A., S. Zaza, C. Langkop, R. V. Tauxe, and P. A. Blake. 1990. A multi-state outbreak of *Salmonella chester* linked to imported cantaloupe. Abstra. 915, p. 238. Prog. Abst. 30th Interscience Conference on Antimicrobial Agents and Chemotherapy, American Society of Microbiology, Washington, D.C.
14. SAS Institute Inc. 1989. SAS Users Guide. Cary, NC.
15. Unrein, J. 1990. Melons tested for outbreak link. The Packer. 97(13): 3A, March 31, 1990.
16. Unrein, J. 1990. Tainted tomato source to be named. The Packer. 97(34):4A, August 25, 1990.

Reflections from the Past

The President's Address

John J. Sheuring

Forty-Eighth Annual Meeting of the International Association of Milk and Food Sanitarians, Inc.
August 14-17, 1961
Savery Hotel
Des Moines, Iowa

Fifty years ago, a group of dedicated sanitarians met and formed an organization that has grown into the largest association of sanitarians in the world, The International Association of Milk and Food Sanitarians, Inc. From that humble beginning involving thirty-five members, the Association has grown until it now has more than 4200 members located in every section of the world. The contributions, made by the members of the Association, have directly or indirectly affected the welfare of millions of people. It is indeed an honor to serve the Association as its President during this Golden Anniversary. In just a few minutes, a group of members who have contributed so much to the Associaton will discuss some of the major accomplishments which have been made during the past fifty years.

On behalf of the Executive Board and the members of the Association, I want to express our sincere appreciation to the members of the Iowa Affiliate for their wonderful spirit of cooperation in arranging this meeting at Des Moines. As most of you know, this meeting was originally scheduled to be held at Jekyll Island, Georgia, under the joint sponsorship of the Florida, Georgia, and South Carolina Affiliates. Due to a number of problems, the meeting could not be held as scheduled. The Iowa group has done a marvelous job during the transition and we appreciate all of the help which has been given. I want to thank all of the sanitarians in the Southeast who helped so much in planning the meeting for that area and I am sure they were disappointed in having the location changed. They are a loyal group and will continue to do everything possible to further the objectives of the International Association of Milk and Food Sanitarians.

The President of the Association seldom has an opportunity to discuss policies with the members, therefore, he appreciates having a few minutes on the program to discuss the progress, problems, and plans for the future for the Association.

We have known for many years that it was imperative to improve the lifeline to our members, the *Journal of Milk and Food Technology*. Two years ago, you approved an increase in dues with the understanding that the increase in revenue would be used primarily to provide editorial assistance in connection with publication of the journal. No action could be taken by the Executive Board until we were convinced fully that sufficient funds would be available on a continuing basis to provide adequate capital for hiring an adequate person. Several differences of opinion have been expressed about the job description, qualifications of the individual, and these had to be resolved. I am happy to announce that definite action has been taken at this meeting, by the Board, to proceed to hire an Assistant Executive Secretary within the next ninety days. The primary responsibility of this employee will be to supervise the work of preparing the journal for publication and to provide editorial assistance particularly in the coverage of Association affairs. In addition he will have the responsibility of learning the details of the Association administration. We are looking for a qualified individual and will accept recommendations and applications through our Shelbyville office.

At our annual meeting in Chicago a year ago, two important groups held preliminary meetings. Through the efforts of the Executive Board, Dr. Kenneth Weckel, the Farm Methods Committee of our Association, and members of various dairy groups, a National Mastitis Action Committee was organized. The primary objective of the Committee was to correlate all research and educational activities pertaining to the control of mastitis. I am happy to report that positive action has been taken and the National Mastitis Council, Inc., has been organized on a permanent basis. The officers of the Council are Dr. Robert Metzger, President; Mr. George Willits, Executive Secretary; and Mr. M. G. Van Buskirk, Treasurer. A report of the activities of the Council will be given tomorrow morning.

Another important organizational meeting at Chicago was sponsored by our Committee on Ordinances and Regulations. A group of men, representing various phases of our dairy industry, met to discuss the possibility of organizing a National Committee on Coordination of Labeling, Definitions, and Standards for Milk and Its Products. I am happy to announce that definite progress has been made by this committee and a report will be given to you tomorrow morning concerning its activities.

For the past several years, the International Associaton of Milk and Food Sanitarians has sponsored the William B. Palmer Scholarship which has been financed by contributions from the Affiliates. This method of financing has not proven successful. I am happy to announce that the Executive Board has approved Association funds to continue this scholarship program. The winner of the Award for this year will be announced at the banquet tomorrow evening.

Many of you have expressed opinions concerning the possibility of having closer working relationships with the various sanitarian organizations in the country. Through the efforts of the Sanitarian's Joint Council, progress has been made in some programs which are of mutual interest to all sanitarians, for example, the Model Registration Act. I am happy to announce that the Executive Board has provided funds to finance our representatives on the Council and has given them instructions to pursue with vigor the establishment of a Specialty Board which will recognize sanitarians who have demonstrated outstanding qualities in their profession. A meeting of the Council is scheduled for November of this year.

I would like at this time to discuss some of the problems of the Association and make certain recommendations in trying to help solve them. I must emphasize that these are my personal opinions and do not necessarily reflect the majority opinion of the Executive Board and the Association.

Our financial situation is excellent and money is being added to our reserves. We felt that increasing dues would cause a major decrease in membership for one or two years. I am happy to announce that this situation did not occur and our membership has remained loyal through this period of financial readjustment. Our Association is stronger at this time than ever before in its history.

Having served on various committees and the Executive Board of the Association for almost ten years, I hope that what I have to recommend will get accepted on the premise that the recommendations are in the best interest of the Association. I know that many of you will disagree with the recommendations and you should express yourself accordingly. Only through open discussion, constructive criticism, and positive action can our problems be solved.

Under the provisions of the Constitution and Bylaws of the Association, an elected officer serves on the Executive Board for six years. Any previous officer will verify that he does this at considerable personal expense, loss of time from his regular employment, and is subjected to a certain amount of pressure which is sometimes unpleasant. He is rewarded by knowing that he is doing his best to serve the Association, that he makes a host of new friends, and by learning to acquire more patience than he ever anticipated. However, unless an officer has a very generous and understanding boss, an efficient secretary, and is willing to spend a good portion of his time working for the Association, he should never accept a job as an elected officer of the International Association of Milk and Food Sanitarians. Some of us are more fortunate than others in having the above cooperation, but in my particular case, it has required hiring additional secretarial help. I am happy to announce that the Board has taken action at this meeting to provide a contingency fund for use by the President. We hope this will enable more men to con-

sider accepting an elective office of the Association when economic conditions might otherwise deter them.

I believe no officer of the Association should be expected to serve more than three years on the Executive Board. There is some tendency for the Board, under the present procedures, to become static. Each time a new member joins the Board, all of the old problems have to be rehashed which means considerable loss of time in trying to get problems solved. As a result, a Board member gets somewhat discouraged after about four years. I would recommend that at the next annual meeting, legal steps be taken to change the Constitution and Bylaws of our Association to eliminate the offices of the Second Vice President and the Senior Past President. This will provide financial economies for the Association, an opportunity to have a more flexible Board, and a continuous flow of new blood in the management of the Association.

An association will progress as long as it has goals, the support of its members, and strong leadership. I am firmly convinced that we need to change the method of electing our officers in order to provide a greater voice by our members in these selections. With present travel restrictions pertaining to out-of-state travel, many sanitarians can not attend national meetings. However, this should not deprive them of the right to help elect the officers of the Association. I recommend that we take necessary legal action in changing our Constitution and Bylaws to provide some method of voting which will give the membership a greater voice in the election of the officers of the Association.

The role of the sanitarian is changing rapidly. Our Executive Secretary reported last year the number of sanitarians engaged in various phases of public health work. This report showed that we are not just milk and food sanitarians but a large number of our members are engaged primarily in general sanitation. We are faced with the possibility of losing some affiliates unless we take positive action in changing the name of our Association to include the general sanitarian. We have discussed this problem many times, like most of the other problems, but we are remaining static and this may be the way the majority of the members would prefer to have it. I am pointing out the problem and believe we should change our name accordingly. I recommend that the necessary action be taken at our next annual meeting.

There are some definite trends taking place in this country pertaining to sanitarian organizations. Sanitarians are being asked to join different organizations and often question how many of them are really contributing to their profession. They have to decide how many organizations they wish to join, how much they are willing to pay in dues, and which organization will serve them the best. This is getting to be a more important decision, especially with registration continuing to proceed under state laws. I think we should make every effort to work with other sanitarian organizations to help solve these problems primarily for the benefit of sanitarians. I am sure this is not a popular position in some sections of our Association but I am more concerned with the future interests of sanitarians than running a popularity contest.

It seems to me that we should take some active steps in reorganizing the committees of the Association. We have some excellent committees under the guidance of strong leaders. We have some committees that do nothing. Perhaps, some of the committees have no real objective, are too large, and lack good organization. I believe this problem should be studied very carefully and some definite action taken. Perhaps, new committees should be established, old ones reorganized and in some instances abolished. The Executive Board has taken action at this meeting to instruct the two Vice Presidents of the Association to make a thorough study of this problem next year and report at the next Annual Meeting.

The administration of an Association of this type is extremely difficult and cumbersome. I have some firm convictions about the duties of the Executive Board and the Executive Secretary. It is almost impossible for either the Board or the Executive Secretary to accomplish some objectives under present administrative policies. This is a situation which should be remedied by a continuous study of the responsibilities of the Board and the Executive Secretary. Unless I should be misunderstood, this is no personal criticism of any Board member or the Executive Secretary. It is a situation which has developed because responsibilities are not as clearly defined as they might be. Many important matters are not handled properly because of this lack of coordination of responsibilities.

I hope these recommendations are accepted in the spirit they are given, which is to help our Association and its members. It seems to me that the President should point out the problems to the members as he interprets them.

I want to thank all of the dedicated people of this Association, the Executive Board, and our Executive Secretary for their help, constructive criticisms, and patience. I am sure that most people act on the basis of their convictions. If others disagree with those convictions, this is as it should be and objections should be voiced.

We are all dedicated to the proposition that we have the best sanitarian organization in the world and will do everything we can to insure its continued success. The Association belongs to you; whether it succeeds, remains static, or fails, is entirely in your hands. The officers whom you elect can serve to the best of their ability but they can not make all of the decisions for you.

Reprinted from the *Journal of Milk and Food Technology, Vol. 24, No. 9.*

Fifty-Third Annual Meeting of IAMFES

August 15-18, 1966
Minneapolis, Minnesota

Prospects for a well-attended annual meeting were anything but good with the airlines strike still in effect as annual meeting arrangements were finalized by the Minnesota-affiliate, sponsors of the 53rd annual meeting of IAMFES. Actually, there was little need for concern as registration soared to 459, second highest in the history of the Association, and exceeded only by the 1952 annual meeting also held in Minneapolis. Ladies' and children's registration reached an all time high of 83.

On hand early, the Board of Directors began their executive sessions Sunday morning and continued through Monday evening. Appropriate Board actions will be reported later.

Eleven Affiliate Association Secretaries or delegates were represented among the seventeen who attended the Affiliate Council meeting Monday evening. Mr. John Fritz, Senior Past President represented the Board of Directors and explained Association activities and policies. The minutes of the meeting were published in the journal.

Monday evening the first of two informal get-togethers occurred with refreshments made available by Land O' Lakes Creameries. Tuesday evening after the evening discussion sessions the North Central Cheese Industries Association bosted an informal gathering with several varieties of cheese available to ease the hunger pains.

The opening session Tuesday morning was highlighted first by President Uetz's address on his stewardship of the Association during the past year and later by two addresses dealing with various sanitation problems in space explorations. President Uetz minced no words in informing the membership of the need to provide adequate funds for proper financing the Association activities. Evidently his words were taken seriously (see complete text of Presidential Address in this issue) as the membership voted a dues increase of $8.00 and $10.00 for affiliate and direct memberships, respectively, at the business meeting Wednesday morning. President Uetz also called for immediate solution to the problems created by a "multiplicity of sanitarian organizations, publications and services," stating that such duplications are unwarranted and uneconomical. He also announced the appointment of a newly created Food Protection Committee, the objectives of which will, among other things seek to coordinate the efforts of several other Committees whose activities bear on the general area of food protection. This could be an important Committee if its objectives are clearly spelled out. It will have to guard carefully against becoming merely a forum for rehashing the results of other Committee activity.

Dr. M. S. Favero provided an insight into the problems and their solutions involving the sterilization of interplanetary space vehicles and other hardware. Summaries of this paper and all others which were available appear elsewhere in this issue. Complete texts of most papers given on the program will appear in subsequent issues of the journal.

Dr. V. W. Greene was the third speaker on the opening session. Now a member of the staff of the University of Minnesota School of Public Health, Dr. Green called upon his extensive industrial and institutional experiences, involving sanitation problems in space exploration and movement and distribution of microbial contaminants, to give the audience a preview of what's to come in the Sanitarian's activities in the future.

Attendance at all sessions throughout the meetings was exceptional. This indeed was a tribute to the efforts of the program Committee headed by Dr. Paul R. Elliker. The evening discussion sessions too were unusually well attended.

The Annual Banquet Wednesday evening truly was a gala affair. Preceding the banquet, members and guests were hosted at a cocktail party by Norris Dispensers, Inc. of Minneapolis. This organization hosted

a similar affair at the 1952 Meeting in Minneapolis. Music by Miss Kathy Kohls who moved about from group to group and table to table during the Cocktail hour and the banquet added much to the enjoyment of all.

Presentation of Association awards was of course the highlight of the evening. The Sanitarian's Award and accompanying check for one thousand dollars was awarded to Mr. Paris B. Boles (see report elsewhere this issue) Senior County Sanitarian, Wayne County Health Department, Monticello, KY.

Dr. J. C. Olson, Jr., Editor of the journal was the recipient of the Association's Citation Award which is given annually in recognition of a member who has made meritorious contributions to furthering the aims of the Association and the professional interests of sanitarians.

The Association also honored past Citation Award winner Dr. Milton V. Fisher, Chief, Milk Control Section, St. Louis Health Department by electing him to Honorary Life Membership.

Near the close of the formal activities of the banquet Dr. Paul R. Elliker was installed as new *President* of IAMFES by outgoing *President* Fred E. Uetz. Also election of Milton Held as *Second Vice President* was announced. Since the *President-Elect, First* and *Second Vice Presidents* advance automatically to offices of *President, President-Elect* and *First Vice President,* respectively, the Executive Board of the Association now is as follows: *President,* Dr. P. R. Elliker, Chairman, Department of Microbiology, Oregon State University, Corvallis; *President-Elect,* A. N. Myhr, Professor, Department of Dairy Science, Ontario Agricultural College, Guelph; *First Vice President,* S. O. Noles, State Board of Health. Jacksonville, Florida; *Second Vice President,* Milton Held, Regional Milk and Food Consultant, U. S. Public Health Service, Regional Office, San Francisco; *Junior Past President,* Fred E. Uetz. The Borden Co., New York; and *Senior Past President,* Dr. W. C. Lawton, Director of Laboratories and Quality Control, Twin City Milk Producer's Assoc. Minneapolis, MN.

The ladies' program during the meeting was enjoyed by all. The largest turnout of ladies ever occurred at this meeting. Particularly enjoyable was the coffee party hosted by Mrs. Fred E. Uetz Tuesday morning, the bus tour of Minneapolis, and the luncheon at Diamond Jim's Restaurant, the latter hosted by Sep-Ko Chemical Co., of Minneapolis.

The Association, formally at the business meeting and informally by many present, was lavish in complementing the local arrangements Committee headed by Mr. Ben Zakarison, of Land O'Lakes Creameries. Arrangements were complete in every detail which resulted in a smooth functioning Annual Meeting in all respects.

August 19-22, 1967, are the dates of the next annual meeting in Miami. Florida. The Florida Association is well along in their planning. Sam Noles assures us that Florida weather will especially favor us so make your plans to attend the meeting and combine it with an enjoyable vacation for your family in Florida.

Reprinted from the *Journal of Milk and Food Technology, Vol. 29, No. 9.*

Highlights

of the Executive Board Meeting

November 12 - 14, 1999

Des Moines, Iowa

Following is an unofficial summary of Executive Board actions from the IAMFES Executive Board Meeting:

Approved the following:

- Minutes of July 30-August 5, 1999 Executive Board Meeting.
- To suspend printing a Membership Directory and to provide Member contact information on the Web site at a "Members only" section.
- To allow a special rate Membership for E-1 to E-4 Army Food Inspectors on a two year trial.
- Revisions to the Personnel Policy Manual, effective December 1, 1999.
- Revisions to Executive Board position descriptions for the Policy Manual.
- To become a member of the Alliance for Food Safety Communication.
- To allow Seward, Limited (UK) to sponsor and present a new award, "Innovations in Food Microbiology Award" at the 2000 Annual Meeting.

Discussed the following:

- E-mail votes taken since the August Executive Board Meeting.
- Communication Update: Journals remain on schedule, reports on both *DFES* and *JFP* were accepted, Web site revisions.
- Membership Update: Membership continues to outpace 1998, 1997 and 1996 levels; use of Membership mailing list.
- Advertising Update: Ad sales improve, over 30 Exhibit Hall spaces reserved, sponsorship for Annual Meeting beginning strong.
- Financial Update: Audited financial statements were presented.
- Retirement Plan contribution set during an Executive Session.
- Tellers report showing acceptance of the Constitutional changes which effectively changed the Association name to the International Association for Food Protection was received.
- Projects for the Committee on Communicable Diseases Affecting Man.
- The need to send a letter to Committee Chairpersons to inform them that per the Bylaws, new Chairpersons will take office at the Sunday Committee meeting that takes place at the Annual Meeting.
- Responses to all Committee recommendations from Committee meetings held at the August 1999 Annual Meeting. A complete listing will be distributed to all Committee Chairpersons and Vice Chairpersons.
- Received a preliminary report from the 3-A Task Force.
- The Secretary nomination process and status.
- The need to establish Committee pages and guidelines for use of the Association Web site.
- Executive Board presentations at Affiliate meetings.
- The fall 1999 Affiliate Newsletter.
- Bylaws changes affecting Affiliate organizations.
- Name change legal issues.
- Future goals for the Association.
- A project to record in writing the history of the Association.
- Review of the 1999 Annual Meeting events and schedules.
- Future Workshop ideas.
- Planning for 2000, 2001 and 2002 Annual Meetings; future Annual Meeting sites.
- Report from co-sponsorship of Food Micro 99.
- Co-sponsorship of Japan PC2000 and ASAE 2000.
- Exhibitng at the International Fresh-cut Produce Association Conference.
- Establishment of a Student PDG.

Next Executive Board meeting: January 23 - 24, 2000, Atlanta, Georgia.

Committee, Professional Development Group, Task Force and Support Group

Recommendations to the Executive Board as Taken from Committee Minutes of Meetings Held in Dearborn, Michigan

August 1 – 4, 1999

Executive Board Response as Discussed at the Executive Board Meeting Des Moines, Iowa November 12 – 14, 1999

STANDING COMMITTEES

Dairy, Food and Environmental Sanitation
Management Committee

1. Donna Bahun and David Tharp should develop a Business Plan for *DFES*. The committee suggests that the IAMFES strategic plan of 1994 or 1995 be considered when developing this plan.
   Board Response: Donna Bahun and David Tharp contact Linda Harris and Bill LaGrange to develop operational guidelines for *DFES* including a publication plan.

2. Linda Harris and Christine Bruhn will stand as candidates for Chair and Vice Chair of the *DFES* Management Committee. The committee agrees to accept the decision of the President Elect Jack Guzewich for selection of Chair and Vice Chair.
   Board Response: Linda Harris was appointed and accepted the Chairperson position through August 4, 2001 and Christine Bruhn was appointed and accepted the Vice Chairperson position.

3. It is recommended that the publication schedule be modified in the media kit. The concept of feature articles is only appropriate for issues with regular features such as annual meeting issues or the 3-A Sanitary Standard Holders' List. It is recommended that other issue themes be discontinued.
   Board Response: This recommendation has been implemented for the 2000 year.

Journal of Food Protection
Management Committee

1. That the costs/benefits of offering electronic/online delivery of *JFP* be investigated.
   Board Response: Staff to provide cost estimate (including the cost to subscribe) to the Executive Board and *JFP* Management Committee for consideration.

2. That *JFP*/IAMFES staff investigate costs of offering retrospective issues of *JFP* (5+ years) in Index Medicus.
   Board Response: Staff to provide information to the Chairperson of *JFP* Committee and Executive Board by January's Board meeting.

3. That John Sofos be re-appointed for another four-year term as Scientific Co-Editor.
   Board Response: Agree with recommendation and confirmed re-appointment of John Sofos.

Past Presidents' Advisory Committee

No recommendations received.

Program Committee

1. The option for LCD projectors to be available to presenters.
   Board Response: Staff to conduct cost analysis. Executive Board suggests providing LCD projectors during symposia sessions only. Staff and Program Committee to establish usage guidelines if cost analysis is approved.

2. Donna Garren nominated to chair Developing Scientist Awards Competition.
Board Response: Approved.

3. No watermarks or logo; placement and size restriction for both slides and posters.
Board Response: Executive Board agrees. This is currently covered in the Commercialism Policy for Annual Meeting presentations.

SPECIAL COMMITTEES

Committee on Communicable Diseases Affecting Man

1. Improve communications with this Committee.
Board Response: Communication is on-going between the Committee and Exective Board.

2. Assist in sorting out responsibilities of the Committee and Professional Development Groups that have common interest. Serious overlapping is occurring. This will become more complicated as this situation is allowed to occur.
Board Response: As stated in the Association Bylaws, the Committee on Communicable Diseases Affecting Man is charged with: (1) review of information on epidemiology and control of communicable diseases that are of primary concern to food safety and related areas; and (2) to prepare manuals and articles addressing investigation and control of problems related to food safety. Professional Development Groups promote professional development in specific disciplines or areas of interest.

Committee on Sanitary Procedures

1. Due to the nature of activities and the need for continuity, CSP recommends that the term of office for the chairperson and vice chairperson be extended.
Board Response: Agree with recommendation.

Nominating Committee

Minutes not received.

Teller Committee

Minutes not received.

PROFESSIONAL DEVELOPMENT GROUPS

Applied Laboratory Methods Professional Development Group

1. Rapid Methods Workshop for future annual meetings, hands on format with a focus on *Listeria* and *Campylobacter*. Preliminary plan prepared.
Board Response: The Executive Board encourages further development and coordination with the Program Committee to present this workshop.

Audiovisual Library Professional Development Group

1. That the AVL users evaluation form be re-evaluated and revised as necessary to encourage more and better responses from users.
Board Response: Staff will revise form with Chairperson's assistance.

2. That the AVL committee review users' comment at the annual committee meeting (or interim) to monitor quality and usefulness of AVL holdings.
Board Response: The Executive Board welcomes Committee members' input.

3. That frequent AVL users be identified from database, and asked to review materials on an ad hoc basis.
Board Response: The Executive Board agrees.

4. That materials received produced by federal agencies (e.g. USDA, FDA) not be reviewed before adding to library holdings.
Board Response: The Executive Board agrees.

5. That return postage be provided when materials are sent to reviewers.
Board Response: Association will provide cost of return shipments.

6. That AVL/IAMFES staff modify AVL users' database, if necessary to provide estimates of costs for shipping materials internationally.
Board Response: IAMFES staff will track cost and frequency.

7. That AVL staff request originators of slide presentations to reproduce them on videotape, or use AVL users' comments to evaluate suitability of such materials, rather than have reviewers assess slide presentations.
Board Response: The Executive Board suggests scanning the slides to place them on a CD-ROM.

8. That users and all IAMFES members be encouraged to identify/refer relevant materials to add to the AVL.
Board Response: The Executive Board agrees.

9. That the AVL budget requested from the Foundation Fund be increased from $9,000 to $10,500 to cover increased salary and postage costs.
Board Response: This reflects a change in the budget as was previously approved by the Executive Board.

10. That the Board extend appreciation to Tom Gilmore for years of service as chairperson of the AVL, and appoint a new chairperson.
Board Response: The Executive Board appreciates Tom Gilmore's many years of service to the Audiovisual Library Committee and appointed John Christy as Chairperson.

Dairy Quality and Safety Professional Development Group

No recommendations received.

Food Safety Network Professional Development Group

No recommendations received.

Food Sanitation Professional Development Group

No recommendations received.

Fruit and Vegetable Safety and Quality Professional Development Group

No recommendations received.

Meat and Poultry Safety and Quality Professional Development Group

No recommendations received.

Microbial Food Safety Risk Assessment Professional Development Group

1. Marketing of the risk assessment workshop is a concern. We would like to market one workshop to a very general audience, and the second workshop to a more advance audience. Those who want hands-on "How to" experience in quantitative risk assessment methods.
Board Response: The Executive Board agrees.

2. Approval of planning and scheduling of the workshops. The Board needs to be made aware that the more advanced workshop may be more expensive due to the need for on-site computer facilities.
Board Response: The Executive Board Agrees. Budgets for both workshops need to be developed and approved.

3. Approval of Dick Whiting as upcoming co-chair.
Board Response: The Executive Board Approved Dick Whiting as Vice Chairperson.

4. Direction from the Board as to whether to proceed in planning a risk assessment manual in collaboration with the Communicable Disease of Man group.
Board Response: The Executive Board encourages continued communication with the Committee on Communicable Disease Affecting Man about this project. Because of the changing direction of risk assessment, the PDG may want to develop an article for publication on the current status and future direction and options for risk assessment.

Seafood Safety and Quality Professional Development Group

1. Scheduling symposia is a problem. However certain topics in the sessions will overlap, thus splitting interested audience. Hence, minimize overlapping symposia on last day as generally attendance gets thinner.
Board Response: The Executive Board points out that the Program Committee goes to extreme efforts to minimize overlap of common interest topics.

Viral and Parasitic Foodborne Disease Professional Development Group

1. Approval of Dean Cliver as incoming committee chairperson.
Board Response: The Executive Board approved and appointed Dean Cliver as Chairperson.

TASK FORCES

Awards Task Force

No recommendations received.

Constitution and Bylaws Task Force

1. To reappoint current task force members for another year during the transition period. Michael Brodsky agreed to remain as chairperson. Charles Price and Robert Sanders agreed to remain as Members. Allan Saylor has resigned his appointment, but David Fry agreed to serve as a Member. Ron Case will have to be contacted to determine if he wishes to continue. If not, a replacement will be required.
Board Response: The Executive Board Agrees with the Task Force recommendations regarding Members and Chairperson.

Developing Scientist Awards Task Force

Minutes not received.

Education Task Force

1. To form an Education Committee with the mission to identify, review, and recommend educational material for the web page and to recommend strategies to Members for communication of food safety information to the K-12 audience.
   Board Response: Because of the "limited nature" established for Task Forces, the Executive Board disbanded this Task Force. It was recommended that if sufficient interest exists, the group pursue formation as a PDG.

SUPPORT GROUPS

Affiliate Council Support Group

1. Study/evaluate potential for occasional joint annual meetings between IAMFES and NEHA (1st, J. Bruhn; 2nd, H. Uhlman); motion carried;
   Board Response: The Executive Board agrees that joint regional meetings or workshops may be of interest. The Executive Board does not have interest in holding joint annual meetings with NEHA at this time.

2. Recommend/support for use of new technology (e.g., LCD projectors with compatible software, etc.) at the 2000 Annual Meeting (1st, C. Price; 2nd, H. Uhlman); motion carried;
   Board Response: Staff to conduct cost analysis. Executive Board suggests providing LCD projectors only during symposia sessions. Staff and Program Committee to establish usage guidelines if cost analysis is approved.

3. Establish CEU's for attendance at IAMFES Meetings (1st, J. Bruhn; 2nd, G. Swick); motion carried;
   Board Response: Staff to investigate CEU programs and what resources would be necessary to provide for Annual Meeting attendees. Report to the Executive Board at the January meeting.

4. Comments:

   a. continue to monitor and improve upon hotel reservation systems, etc. for annual meetings;
      Board Response: The Executive Board encourages all attendees to make hotel reservations early to ensure the ability to stay in the host hotel.

   b. include the Affiliate Council to assist the Executive Board with the new member reception event;
      Board Response: The Executive Board invites the Affiliate Council and Delegates to assist with the new Member reception.

   c. develop a Saturday workshop on Affiliate leadership topics.
      Board Response: The Executive Board encourages the Affiliate Council Members to establish a workshop for Affiliate leadership.

Foundation Fund Support Group

1. The silent auction be continued as an activity of the annual meeting.
   Board Response: The Executive Board agrees.

2. The $19,300 budget for FY00 be approved.
   Board Response: This reflects the budget as was previously approved by the Executive Board.

3. The current six programs being supported by the Foundation Fund be continued.
   Board Response: The Executive Board agrees.

4. The change in the bylaws, page 17, paragraph 1.8, line 3 - a chairperson, vice chairperson be changed to - a chairperson and vice chairperson be approved.
   Board Response: The Executive Board agrees.

5. Express the support group's appreciation to the central office.
   Board Response: The Executive Board agrees.

International Association for Food Protection

Award Nominations

The International Association for Food Protection welcomes your nominations for our Association Awards. Nominate your colleagues for one of the Awards listed below. Only Members are eligible to be nominated (does not apply to the NFPA Food Safety Award). You do not have to be a Member of the Association to nominate a deserving professional.

To request nomination criteria, contact:

International Association for Food Protection
6200 Aurora Avenue, Suite 200W
Des Moines, Iowa 50322-2863, USA
By telephone: 800.369.6337; 515.276.3344
Fax: 515.276.8655
Web site: www.foodprotection.org
E-mail: info@foodprotection.org.

Nominations deadline is February 18, 2000. You may make multiple nominations. All nominations must be received at the International Association for Food Protection's office by February 18, 2000.

- Persons nominated for individual awards must be current Members of the Association. Black Pearl Award nominees must be a company employing current Members. NFPA Food Safety Award nominees do not have to be Members of the Association.
- Previous award winners are not eligible for the same award.
- Executive Board Members and Awards Committee Members are not eligible for nomination.
- Presentation of awards will be during the Awards Banquet at the Annual Meeting in Atlanta, Georgia on August 9, 2000.

Nominations will be accepted for the following Awards:

Black Pearl Award – Award Showcasing the Black Pearl

Presented in recognition of a company's outstanding achievement in corporate excellence in food safety and quality.

Sponsored by Wilbur Feagan and F&H Food Equipment Company.

Fellows Award – Distinguished Plaque

Presented to individuals for their contribution to the Association and its Affiliates with quiet distinction over a prolonged period of time.

Sponsored by the International Association for Food Protection.

Honorary Life Membership Award – Plaque and Lifetime Membership in the Association

Presented to Members for their devotion to the high ideals and objectives of the Association and for their service to the Association.

Sponsored by the International Association for Food Protection.

Harry Haverland Citation Award – Plaque and $1,000 Honorarium

Presented to an individual for years of devotion to the ideals and objectives of the Association.

Sponsored by DiverseyLever/U.S. Food Group.

Harold Barnum Industry Award – Plaque and $1,000 Honorarium

Presented to an individual for outstanding service to the public, the Association and the food industry.

Sponsored by NASCO International, Inc.

Educator Award – Plaque and $1,000 Honorarium

Presented to an individual for outstanding service to the public, the Association and the arena of education in food safety and food protection.

Sponsored by Nelson-Jameson, Inc.

Sanitarian Award – Plaque and $1,000 Honorarium

Presented to an individual for outstanding service to the public, the Association and the profession of the Sanitarian.

Sponsored by Ecolab, Inc., Food and Beverage Division.

NFPA Food Safety Award – Plaque and $3,000 Honorarium

Presented to an individual, group, or organization in recognition of a long history of outstanding contribution to food safety research and education.

Sponsored by National Food Processors Association.

Past Awardees

BLACK PEARL AWARD

Sponsored by Wilbur Feagan and F & H Food Equipment Company, Springfield, Missouri

1994–HEB, Co., San Antonio, Texas
1995–Albertson's Inc., Boise, Idaho
1996–Silliker Laboratories Group, Inc., Homewood, Illinois
1997–Papetti's of Iowa Food Products, Inc., Lenox, Iowa
1998–Kraft Foods, Inc., Northfield, Illinois
1999–Caravelle Foods, Brampton, Ontario, Canada

FELLOWS AWARD

1998–Larry Beuchat
1998–Lloyd Bullerman
1998–Frank L. Bryan
1998–Michael P. Doyle
1998–Harry Haverland
1998–Elmer H. Marth
1998–Edmund A. Zottola
1999–A. Richard Brazis
1999–Michael H. Brodsky
1999–James M. Jay
1999–Robert T. Marshall
1999–Lawrence A. Roth
1999–Earl O. Wright

HONORARY LIFE MEMBERSHIP AWARD

1957–J. H. Shrader
1958–H. Clifford Goslee
1959–William H. Price
1960–None Given
1961–Sarah Vance Dugan
1962–None Given
1963–Cyrie Kay Johns and Harold Macy
1964–C. B. and Arthur L. Shogren
1965–Fred Basselt and Ivan Parkin
1966–Milton R. Fisher
1967–Charles A. Abele and Luther A. Black
1968–M. P. Baker and William C. Frazier
1969–John Faulkner
1970–Harold J. Barnum
1971–William V. Hickey
1972–Clarence W. Dromgold and Evert Wallenfeldt
1973–Fred E. Uetz
1974–H. L. "Red" Thomasson and Ken G. Weckel
1975–Arthur E. Parker
1976–A. Bender Luce
1977–Harold Heiskell
1978–Karl K. Jones
1979–Joseph C. Olson, Jr.
1980–Alvin E. Tesdal and Laurence G. Harmon
1981–Robert M. Parker
1982–None Given
1983–Orlowe Osten
1984–Paul Elliker
1985–Patrick J. Dolan, Franklin W. Barber and Clarence K. Luchterhand
1986–John G. Collier
1987–Elmer Marth and James Jezeski
1988–Kenneth Whaley and Paul J. Pace
1989–Earl Wright and Vernon Cupps
1990–Joseph E. Edmondson
1991–Leon Townsend and Dick B. Whitehead
1992–A. Richard Brazis and Harry Haverland
1993–None Given
1994–Ken Kirby
1995–Lloyd B. Bullerman and Robert T. Marshall
1996–Richard C. Swanson
1997–Frank L. Bryan
1998–Henry V. Atherton and David D. Fry
1999–Sidney W. Barnard, Michael H. Brodsky, Charles W. Felix, and James L. Smith

HARRY HAVERLAND CITATION AWARD

Sponsored by DiverseyLever/U.S. Food Group, Cincinnati, Ohio

1951–J. H. Shrader and William B. Palmer (posthumously)
1952–Charles A. Abele
1953–Clarence Weber
1954–Cyrie Kay Johns
1955–R. G. Ross
1956–Ken G. Weckel
1957–Fred C. Baselt
1958–Milton R. Fisher
1959–John D. Faulkner
1960–Luther A. Black
1961–Harold S. Adams
1962–Franklin W. Barber
1963–Merle P. Baker
1964–William K. Moseley
1965–H. L. "Red" Thomasson
1966–Joseph C. Olson, Jr.
1967–William V. Hickey
1968–A. Kelley Saunders
1969–Karl K. Jones
1970–Ivan E. Parkin
1971–L. Wayne Brown
1972–Ben Luce
1973–Samuel O. Noles

1974–John C. Schilling
1975–A. Richard Brazis
1976–James Meany
1977–None Given
1978–Raymond A. Belknap
1979–Harold E. Thompson, Jr.
1980–Don Raffel
1981–Henry V. Atherton
1982–None Given
1983–William B. Hasting
1984–Elmer H. Marth
1985–Ralston B. Read, Jr.
1986–Cecil E. White
1987–None Given
1988–Carl Vanderzant
1989–Clem Honer
1990–None Given
1991–Frank L. Bryan
1992–Ewen C. D. Todd
1993–Robert C. Tiffin
1994–Sidney E. Barnard
1995–Charles W. Felix
1996–Joseph J. Disch
1997–Earl O. Wright
1998–Anna M. Lammerding
1999–John C. Bruhn

EDUCATOR-INDUSTRY AWARD

1973–Walter A. Krienke
1974–Richard P. March
1975–K. G. Weckel
1976–Burdet H. Heinemann
1977–Elmer H. Marth
1978–James B. Smathers
1979–Joseph Edmondson
1980–James R. Welch
1981–Francis F. Busta

In 1982, this award was split into the Harold Barnum Industry Award and the Educator Award.

HAROLD BARNUM INDUSTRY AWARD

Sponsored by Nasco International, Fort Atkinson, Wisconsin

1982–Howard Ferreira
1983–C. Dee Clingman
1984–Omer Majerus
1985–William L. Arledge
1986–Hugh C. Munns
1987–John H. Silliker
1988–Kenneth Kirby
1989–Lowell Allen
1990–Roy Ginn
1991–Thomas C. Everson
1992–Ronald Case
1993–David D. Fry
1994–R. Bruce Tompkin
1995–Damien A. Gabis
1996–Dane T. Bernard
1997–John G. Cerveny
1998–None Given
1999–Russell S. Flowers

EDUCATOR AWARD

Sponsored by Nelson-Jameson, Inc., Marshfield, Wisconsin

1982–Floyd Bodyfelt
1983–John C. Bruhn
1984–R. Burt Maxcy
1985–Lloyd B. Bullerman
1986–Robert T. Marshall
1987–David K. Bandler
1988–Edmund A. Zottola
1989–Vernal Packard
1990–Michael Stiles
1991–William E. Sandine
1992–William S. LaGrange
1993–Irving J. Pflug
1994–Kenneth R. Swartzel
1995–Robert B. Gravani
1996–Cameron R. Hackney
1997–Purnendu C. Vasavada
1998–Ronald H. Schmidt
1999–Eric A. Johnson

SANITARIAN AWARD

Sponsored by Ecolab Inc., Food and Beverage Division, St. Paul, Minnesota

1952–Paul Corash
1953–E. F. Meyers
1954–Kelley G. Vester
1955–B. G. Tennent
1956–John H. Fritz
1957–Harold J. Barnum
1958–Karl A. Mohr
1959–William Kempa
1960–James C. Barringer
1961–Martin C. Donovan
1962–Larry Gordon
1963–R. L. Cooper
1964–None Given
1965–Harold R. Irvin
1966–Paris B. Boles
1967–Roger L. Stephens
1968–Roy T. Olson
1969–W. R. McLean
1970–None Given
1971–Shelby Johnson
1972–Ambrose P. Bell
1973–None Given
1974–Clarence K. Luchterhand
1975–Samuel C. Rich
1976–Melvin W. Jefferson
1977–Harold Bengsch

1978–Orlowe Osten
1979–Bailus Walker, Jr.
1980–John A. Baghott
1981–Paul Pace
1982–Edwin L. Ruppert
1983–None Given
1984–Harold Wainess
1985–Harry Haverland
1986–Jay Boosinger
1987–Erwin P. Gadd
1988–Kirmon Smith
1989–Robert Gales
1990–Leon Townsend
1991–James I. Kennedy
1992–Dick B. Whitehead
1993–Lawrence Roth
1994–Charles Price
1995–Everett E. Johnson
1996–Leon H. Jensen
1997–Randall A. Daggs
1998–Terry B. Musson
1999–Gloria I. Swick

DEVELOPING SCIENTIST AWARD

Sponsored by the Foundation Fund, Des Moines, Iowa

1986–	1st	Christine Bruhn
	2nd	Elliott T. Ryser
	3rd	Eileen M. Rosenow
	4th	Lisa M. Flores
	5th	Kamal M. Kamaly
1987–	1st	R. K. Lindenthal
	2nd	Elliott T. Ryser
	3rd	Kathleen M. Knutson
	4th	A. A. Airoldi
	5th	Michelle M. Schaack
1988–	1st	A. A. Airoldi
	2nd	Stephen Ingham
	3rd	Douglas Marshall
	4th	B. J. Overdahl
	5th	P. K. Cassiday
1989–	1st	Nancy Nannen
	2nd	Diane West
	3rd	David Baker
	4th	Karl Eckner
	5th	Hassan Gourama
1990–	1st	Bob Roberts
	2nd	Anna Lammerding
	3rd	Hassan Gourama
	4th	Anna Lambert
	5th	Mona Wahby
1991–	1st	Andrea O. Baloga
	2nd	Elaine D. Berry
	3rd	J. Eric Line
	4th	Donna Williamson
	5th	Keith R. Schneider
1992–	1st	Gary J. Leyer
	2nd	Janice M. Baker
	3rd	Kyle Sashara
	4th	Lynn McIntyre
	5th	Kwang Yup Kim
1993–	1st	Randall K. Phebus
	2nd	J. Eric Line
	3rd	David H. Toop
	4th	Lee-Ann Jaykus
	5th	Tom Yezzi
1994–Oral	1st	J. David Monk
	2nd	Charles Powell
	3rd	Nandini Natraja
Poster	1st	Ratih Dewanti
	2nd	Jitu R. Patel
	3rd	Chen-Jang Liu
1995–Oral	1st	Maria Nazarowec-White
	2nd	Peter Bodnaruk
	3rd	Tina S. Schwach
Poster	1st	James D. Schuman
	2nd	Willie Taylor
	3rd	Wei Tan
1996–Oral	1st	Abbey Nutsch
	2nd	M. Rocelle S. Clavero
	3rd	Robert Williams
Poster	1st	Rod Worobo
	2nd	John Czajka
	3rd	Sherri Kochevar
1997–Oral	1st	Doris D'Souza
	2nd	Paris Leggitt
	3rd	Kunho Seo
Poster	1st	Lisa Lucore
	2nd	Soraya Rosenfield
	3rd	Jeffrey Semanchek
1998–Oral	1st	Peter J. Taormina
	2nd	Brian Shofran
	3rd	Amanda E. Whitfield
Poster	1st	Aysegul Eyigor
	2nd	Ronald D. Smiley
	3rd	Jianming Ye
1999–Oral	1st	Susan Abraham
	2nd	Peter J. Taormina
	3rd	Robert L. Sudler, Jr.
Poster	1st	Ziad W. Jaradat
	2nd	Kazue Takeuchi
	3rd	Yongsoo Jung

FOOD SAFETY AWARD

Sponsored by The National Food Processors Association, Washington, District of Columbia

1998	Food Research Institute at the University of Wisconsin-Madison, Madison, Wisconsin
1999	Michael P. Doyle

SAMUEL J. CRUMBINE AWARD

Sponsored by The Conference for Food Protection in cooperation with The American Academy of Sanitarians; The Association of Food and Drug Officials; The Foodservice & Packaging Institute, Inc.; The International Association for Food Protection.; The International Food Safety Council; The National Association of County and City Health Officials; The National Environmental Health Association; NSF International; Public Health Foundation Enterprises, Inc.; and Underwriters Laboratories, Inc.

From 1955 to 1966 two awards were given: the first for general environmental health, the second for food protection. From 1968 to 1973, the award was suspended due to a general lack of innovation in food protection programs during that period.

1955 Cowlitz-Wahkiakum County Department of Public Health, Washington
New York City Department of Public Health, New York City, New York

1956 Tulsa City-County Department of Public Health, Tulsa, Oklahoma
Macon-Bibb-Jones County Department of Public Health, Georgia

1957 San Jose Department of Public Health, San Jose, California
San Diego County Department of Public Health, San Diego, California

1958 Spokane County Department of Public Health, Spokane, Washington
Los Angeles County Department of Public Health, Los Angeles, California

1959 San Diego County Department of Public Health, San Diego, California
Salt Lake City Department of Public Health, Salt Lake City, Utah

1960 Marion County Department of Public Health, Salem, Illinois
San Bernardino County Department of Public Health, San Bernardino, California

1961 Albuquerque Environmental Health Department, Albuquerque, New Mexico
Philadelphia County Department of Public Health, Philadelphia, Pennsylvania

1962 Rocky Mount Department of Public Health, Rocky Mount, North Carolina
Seattle-King County Department of Public Health, Seattle, Washington

1963 Hamilton County Department of Public Health, Cincinnati, Ohio
Lake County County Department of Public Health, Waukegon, Illinois

1964 Orange County Department of Public Health, Santa Ana, California

1965 Spokane County Department of Public Health, Spokane, Washington
Albuquerque Environmental Health Department, Albuquerque, New Mexico

1966 Imperial County Department of Public Health, El Centro, California
Jefferson County Department of Public Health, Birmington, Alabama

1967 Salt Lake City Department of Public Health, Salt Lake City, Utah

1974 Lexington-Fayette County Department of Public Health, Lexington, Kentucky

1975 None given

1976 Region VI Department of Public Health, Roswell, New Mexico

1977 Los Angeles County Department of Public Health, Los Angeles, California

1978 Arlington County Department of Public Health, Arlington, Virginia

1979 Suffolk County Department of Public Health, Riverhead, Virginia

1980 Allegheny County Department of Public Health, Pittsburgh, Pennsylvania

1981 Nassau County Department of Public Health, Mineola, New York

1982 Winnebago County Department of Public Health, Rockford, Illinois

1983 Pima County Department of Public Health, Tucson, Arizona

1984 Southeastern District Department of Public Health, Idaho

1985 Montgomery County Department of Public Health, Dayton, Ohio

1986 Tri-County Department of Public Health, Colorado

1987 Snohomish Health District, Everett, Washington

1988 San Bernardino County Department of Public Health, San Bernardino, California

1989 Albuquerque Environmental Health Department, Albuquerque, New Mexico

1990 San Joaquin County Environmental Health Division, Stockton, California

1991 Tacoma-Pierce County Health Department, Tacoma, Washington

1992 Boulder County Health Department, Boulder, Colorado

1993 Allegheny County Pennsylvania Health Department, Pittsburgh, Pennsylvania

1994 Du Page County Health Department, Wheaton, Illinois

1995 None given

1996 Snohomish Health District, Everett, Washington

1997 Madison Department of Public Health, Madison, Wisconsin

1998 Clark County Health District, Las Vegas, Nevada

1999 Lake County Health Department, Waukegan, Illinois

C. B. SHOGREN MEMORIAL AWARD

1972-Iowa Affiliate
1973-Kentucky Affiliate
1974-Washington Affiliate
1975-Illinois Affiliate
1976-Wisconsin Affiliate
1977-Minnesota Affiliate
1978-None Given
1979-New York Affiliate
1980-Pennsylvania Affiliate
1981-Missouri Affiliate
1982-South Dakota Affiliate
1983-Washington Affiliate
1984-None Given
1985-Pennsylvania Affiliate
1986-None Given
1987-New York Affiliate
1988-Wisconsin Affiliate
1989-Georgia Affiliate
1990-Texas Affiliate
1991-Georgia Affiliate
1992-Georgia Affiliate
1993-New York Affiliate
1994-Illinois Affiliate
1995-Wisconsin Affiliate
1996-Wisconsin Affiliate
1997-Florida Affiliate
1998-Ontario Affiliate
1999-Wisconsin Affiliate

MEMBERSHIP ACHIEVEMENT AWARDS

HIGHEST PERCENTAGE INCREASE

1998-Alabama Affiliate
1999-Kansas Affiliate

HIGHEST NUMBER INCREASE

1986-Iowa Affiliate
1987-Florida Affiliate
1988-Florida Affiliate
1989-California Affiliate
1990-California Affiliate
1991-Illinois Affiliate
1992-California Affiliate
Illinois Affiliate
1993-California Affiliate
1994-California Affiliate
1995-Texas Affiliate
1996-California Affiliate
1997-California Affiliate
1998-California Affiliate
1999-California Affiliate

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Old Saybrook

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Cullman, AL 35056-1678
256.734.0243
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Alberta Agriculture, Food and Rural Development
6909 - 116th St., 5th Floor
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403.427.4054
E-mail: roth@agric.gov.ab.ca

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University of California-Davis
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One Shields Ave.
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2600 Bull St.
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E-mail: neelyjc@columb72.dhec.state.sc.us

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Dept. Consumer Protection (Food Div.)
State Office Bldg., Rm #167
165 Capitol Ave.
Hartford, CT 06106
860.713.6186

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Deland, FL 32720
904.943.9602

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Todd Silberg
DARDEN Restaurants
3775 Palisade Park Dr.
Duluth, GA 30096
407.245.5835
E-mail: tsilberg@darden.com

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Orofino, ID 83544
208.476.7850

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11920 So. 74th Ave.
Palos Heights, IL 60463
773.722.7100
E-mail: noates@elgindairy.com

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Hammond Health Dept.
649 Conkey St., East
Hammond, IN 46324
219.853.6358

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Monica Streicher
c/o Associated Milk Producers Inc.
3281 40th St.
Arlington, IA 50606
319.933.4521 ext. 222

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Lyon County Health Dept.
420 W. 15th Ave.
Emporia, KS 66801
316.342.4864

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KY River Dist. Health Dept.
441 Gormon Hollow Road
Hazard, KY 41701
606.439.2361

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South Hadley, MA 01075
413.592.5914

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Hamilton, NJ 08691-9430
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E-mail: fredweber@earthlink.net

MICHIGAN ENVIRONMENTAL HEALTH ASSN.

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Past Pres., Ron Holben ..... Lansing
Treas., Bruce DuHamel ..... Hemlock
Sec'y., Laurie Jahn ..... Southfield
Delegate, Holly Mercer ..... Grand Rapids

Mail all correspondence to:
Chuck Lichon
220 W. Ellsworth
Midland, MI 48640
517.832.6656
E-mail: clichon@hotmail.com

MISSISSIPPI ENVIRONMENTAL HEALTH ASSN.

Pres., Royce Freeman ..... Hattiesburg
Pres. Elect, Susan Howell ..... Starkville
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Sec'y. Treas., Regina Holland ..... New Augusta
Delegate, Regina Holland ..... New Augusta

Mail all correspondence to:
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Perry County Health Dept.
P.O. Box 126
New Augusta, MS 39462
601.964.3288

MISSOURI MILK, FOOD & ENVIRONMENTAL HEALTH ASSN.

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Vice Pres., Joel VanHoose ..... Jefferson City
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Ashland Distribution Company Names Tizzard Fine Ingredients District Manager

Ashland Distribution Company has named Richard M. Tizzard district manager for its fine ingredients division's Canadian district.

In his new position, Tizzard will be responsible for managing the Fine Ingredients' sellers in Canada as they serve customers in the food, beverage, personal care, pharmaceutical and nutritional products markets. He will report to Judson W. Smith, director of sales for fine ingredients, and will be based in Mississauga, Ontario, Canada. Tizzard has previously worked for the company's general polymers (GP) division as a district manager for its Canadian operations.

A native of Saint John's, Newfoundland, Canada, Tizzard earned a bachelor's degree in physical health and education from the University of Toronto and a master's degree in business administration from York University.

Joan Walsh Cassedy Named Executive Director of ACIL

Joan Walsh Cassedy has been appointed the new executive director of ACIL, effective October 1, 1999.

For the past five years, Ms. Cassedy had been president and chief executive of King Publishing Group and King Communications Group, Inc., publishers of award-winning business information papers, including *The Energy Daily; Defense Week; New Technology Week; and White House Weekly* and producers of *White House Chronicle*, a weekly public affairs show broadcast on private and public radio and television stations.

For ten years previously she was chairman and co-founder of The International Management Group, Inc., an association management company whose clients included the Society of Toxicology and the International Association for Energy Economics.

Ms. Cassedy received an M.B.A. from the Wharton School of the University of Pennsylvania and a B.A. from Hollins College, VA, and attended the Political Science Institute of the Sorbonne. She is an active member of the National Press Club and immediate past president of the American News Women's Club.

American Association of Cereal Chemists Announces Election Results

The American Association of Cereal Chemists (AACC) announces the election of Julie Jones, professor of food science and nutrition, College of St. Catherine, to president; James Bemiller, professor, Purdue University, to president-elect; Patricia Berglund, assistant dean, Northern Crops Institute, to secretary; and Frederick Hegele, director of quality assurance and regulatory affairs, General Mills, to chair of the board.

Elizabeth McKnight, McCormick & Co. and James Dexter, Canadian Grain Commission, both assumed positions as directors on the board.

Jones, Bemiller, Berglund, Hegele, McKnight, and Dexter officially began their terms at the end of the AACC Annual Meeting, October 31-November 3, 1999, in Seattle, Washington. Patricia A. Richmond of A.E. Staley Manufacturing Company continues as treasurer.

New Field Technical Representative Joins J&W Scientific

J&W Scientific welcomes Scott Abeel as their new field technical representative for the southern US region, Mexico, Central and South America and Puerto Rico. Abeel brings over ten years of worldwide sales and product management experience to J&W.

Abeel received his bachelor of science degree in chemistry in 1986 from Baylor University, Waco, TX and an MBA in marketing management from Texas A&M in 1991. Abeel previously served as product line manager, director of international sales and marketing and technical support chemist for OI Analytical from May 1989 until joining J&W in October 1999.

Within the US, Abeel's primary responsibility will be to provide technical support to J&W customers and distributors. Internationally, he will work to extend J&W's national presence into emerging international markets. Abeel says, "Speaking the language helps, but it is ultimately the quality of the J&W product and level of distributor support we provide that interests representatives and keeps them working on our behalf."

Dr. Lloyd Luedecke Receives the IAMFES Certificate of Merit Award

At the Annual Meeting of the Washington Milk and Food Sanitarians Association, held in Wenatchee on Sept. 22-24, 1999, Dr. Lloyd Luedecke was presented the IAMFES Certificate of Merit Award which is presented to members who have been active in both their Affiliate and IAMFES, and have shown support of the ideals and objectives of IAMFES. Dr. Luedecke more than qualifies in all respects.

Dr. Luedecke received his B.S. degree from Montana State University in 1956, his MS in 1958 and Ph.D. in 1962 from Michigan State University. He joined the staff at Washington State University in 1962 where he still serves the University and the food industries of Washington and the Northwest. He has been teaching the principles of sanitation and quality as they relate to the food industry for 38 years. Lloyd's research has been published in many dairy and food science journals and has been the recipient of many prestigious awards. Dr. Luedecke has served the Washington Milk and Food Sanitarians and IAMFES for 38 years. He is a Past President of the Affiliate, served as Secretary-Treasurer for 26-years and frequently served as the Washington delegate to the IAMFES Affiliate Council. In addition to the above award, Lloyd was also presented the Washington Affiliate Educator Award and was inducted into the Washington Affiliate Hall of Fame.

The Washington Milk and Food Sanitarians Association Celebrates Its 50th Anniversary

The Washington Milk and Food Sanitarians Association has been an active Affiliate of The International Association of Milk, Food and Environmental Sanitarians, Inc./International Association for Food Protection since 1951 and is preparing to celebrate its 50th anniversary next year. The Affiliate is in the process of changing its name to the "Washington Association for Food Protection" to more closely associate themselves with the International Association, and to draw on food professionals in addition to those in the dairy industry. The Affiliate's annual meeting, held in September, is a forum to present educational information and exchange ideas to improve the protection and safety of all foods. Student scholarships, funding to High School and Washington State University judging teams, as well as Hall of Fame and other awards are also presented.

NEWS

Outbreak of *Salmonella* Enteritidis Associated with Shell Eggs in Ireland

One hundred and ten cases of gastroenteritis, 35 of whom were admitted to a hospital, had eaten food from a Chinese take-away restaurant in Dublin on the same evening in October 1999. Delivery dockets for those who ordered meals on this date were used to make telephone contact with customers in order to estimate the extent of the outbreak and to identify controls. A total of 183 people were identified as having eaten from the premises on the evening in question. At that stage, four days after consumption of the food, 75 of these people reported having been ill. A case control study found a strong association between illness and the consumption of egg fried rice (odds ratio 8.1; 95% confidence interval 3.1-21.0).

High rates of constitutional illness and of hospital admission showed that considerable morbidity was associated with this outbreak. *Salmonella* Enteritidis was isolated from 72 cases and 57 isolates were identified as phage type 4.

S. Enteritidis PT4 was also isolated from the shell egg mixture used to cook egg fried rice on the evening in question. The eggs used had been obtained from a supplier who imports eggs from outside the Republic of Ireland. Two weeks previously, *S.* Enteritidis had been isolated from a shell egg obtained from the same supplier during an environmental health inspection. Available information enabled the batch from which this egg had come to be traced.

The Irish Department of Agriculture and Food was informed of both incidents and in turn informed the relevant authorities of the country from which the eggs came. The Food Safety Authority of Ireland liaised with public health authorities of the source country.

The Food Safety Authority has advised the catering industry about the risks associated with using fresh shell eggs for raw or lightly cooked dishes.

The fast Tflash in the panU method used to cook egg fried rice in Chinese cooking, may not ensure that the ingredients are thoroughly cooked. This outbreak highlights the importance of thorough cooking of eggs.

The Irish Egg Association and An Bord Bia, the Irish Food Board, set up an Egg Quality Assurance Scheme earlier this year. This incorporates strict disease control and monitoring measures. The Food Safety Authority encourages retailers and caterers to use pasteurized eggs or obtain their eggs from *Salmonella* controlled flocks, such as those covered by the Egg Quality Assurance Scheme. Not all retailers and suppliers take part in the Egg Quality Assurance Scheme. This outbreak emphasizes the importance of universal participation in such schemes. Commercial caterers and retailers have a duty of care to their customers to provide the safest ingredients (eggs) possible.

Reported by Mary Cronin, Eastern Health Board, Dublin, Ireland.

Recommendations for Preventing Transmission of *Salmonella* from Reptiles to Humans

Pet store owners, veterinarians, and pediatricians should provide information to owners and potential purchasers of reptiles about the risk for acquiring salmonellosis from reptiles.

Persons should always wash their hands thoroughly with soap and water after handling reptiles or reptile cages.

Persons at increased risk for infection or serious complications of salmonellosis (e.g., children aged less than 5 years and immunocompromised persons) should avoid contact with reptiles.

Pet reptiles should be kept out of households where children aged less than 1 year and immunocompromised persons live. Families expecting a new child should remove the pet reptile from the home before the infant arrives.

Pet reptiles should not be kept in child care centers.

Pet reptiles should not be allowed to roam freely throughout the home or living area.

Pet reptiles should be kept out of kitchens and other food-preparation areas to prevent contamination. Kitchen sinks should not be used to bathe reptiles or to wash their dishes, cages, or aquariums. If bathtubs are used for these purposes, they should be cleaned thoroughly and disinfected with bleach.

Insufficient Scientific Data for Bare-Hand-Contact Ban

The Food and Drug Administration (FDA) advisory committee has determined that there are insufficient scientific data to support a complete ban on bare-hand contact of ready-to-eat food and, instead, supports a balanced program of hand washing, food-safety training, and the use of gloves in high-risk food-preparation situations.

The National Advisory Committee on Microbiological Criteria for Foods (NACMCF) recently told industry and consumer experts that while minimizing bare-hand contact provides an additional means of preventing disease transmission, insufficient data exist to support the FDA's recommendation of a blanket prohibition of bare-hand contact in future FDA Model Food Codes.

"We are very pleased with NACMCF's recommendation, which supports what we have been saying all along. We have been working for six years for this change, which is a result of a cooperative relationship between industry and government. We urge the FDA to accept the committee's common-sense recommendation," said National Restaurant Association President and Chief Executive Officer Steven C. Anderson. Rather than the unrealistic prohibition of all bare-hand contact, the Association believes that the solution lies in improved hand-washing compliance, effective hand-washing management coupled with an effective education-and-training program, and glove use for high-risk situations.

Only a Microbial Kill Step Can Ensure Juice Safety

On testimony delivered Dec. 9 during a hearing on juice safety, held by the National Advisory Committee on Microbiological Criteria for foods, NFPA's Dr. Allen Matthys strongly urged the FDA to mandate pasteurization or an equivalent treatment for all juices. FDA is continuing to seek public comment on its proposed rule that would mandate HACCP for juice producers but not require pasteurization.

"It is NFPA's considered opinion, based on science, that only a microbial kill step applied to the juice itself can ensure that potentially pathogenic microorganisms are eliminated," Dr. Matthys stated in his comments at the meeting. "This position is not new; it has been our view, and one we have and will continue to advance. It is based on science and it results in a safe product for all consumers."

Dr. Matthys noted that "NFPA's official position is that juice or juice ingredients should receive pasteurization or an equivalent process sufficient to render the juice or juice ingredients free of vegetative cells of microorganisms of public health significance. In

this regard, we recommend that FDA initiate an appropriate regulatory proceeding to address this and other related issues."

Dr. Matthys pointed out that alternative processing methods that may provide an equivalent kill step include, but are not limited to, batch and continuous high-pressure processing systems; pulsed electric fields; ultraviolet light; electron beam treatment; irradiation; ultra filtration, or use of one or more of the preceding treatments in combination with an anti-microbial compound such as benzoate or sorbate.

Laurie Girand, a representative from the consumer group Safe Tables Our Priority (S.T.O.P.), urged FDA to mandate pasteurization for all processors "until alternatives are proven safe and reliable." The Center for Science in the Public Interest also supported pasteurization or an equivalent process. Dr. Matthys said that "We welcome S.T.O.P's and CSPI's endorsement of pasteurization or an equivalent process as the best way to ensure the safety of juices."

Incorporating Hepatitis A Prevention into Food Service Safety Programs

John Farquharson, President of the International Food Safety Council, and Dr. Richard L. Shafer, President of the North Texas Chapter of the Texas Environmental Health Association and Consumer Health Manager of the Fort Worth Public Health Department, met at the 40th Annual Multi-Unit Foodservice Operators (MUFSO) Conference to discuss incorporating Hepatitis A prevention into food service safety programs.

"The restaurant industry has many effective measures in place for preventing the spread of Hepatitis A in restaurants. But even the strictest control measures cannot guarantee that an already-infected food handler won't transmit the virus to patrons," said Farquharson. "This year at MUFSO, we want to stress to the food service industry the importance of implementing assertive food safety practices, including the vaccination of food handlers, as the simplest means of preventing Hepatitis A outbreaks."

Hepatitis A is a highly contagious virus that attacks the liver. It is spread by the fecal-oral route through close person-to-person contact, or by ingesting contaminated food or water. Symptoms can be debilitating and include fever, fatigue, loss of appetite, nausea, abdominal discomfort, jaundice and dark urine. Infected individuals can unknowingly infect others two weeks prior to feeling ill themselves. Up to 22 percent of adult hepatitis A patients require hospitalization and approximately 100 people in this country die every year from the disease.

Approximately 1.4 million people contract Hepatitis A worldwide and 200,000 people in the United States are infected each year. Hepatitis A cases are on the rise, in spite of the fact that the disease is 100% preventable.

"Even though Hepatitis A is the most preventable type of hepatitis reported in the United States today, outbreaks continue to increase nationally," said Shafer. "Many recent Hepatitis A outbreaks have been attributed to food handlers who can contract the virus and transmit it to others. In fact, there have been cases reported in which thousands of people were potentially exposed by a single food handler. These outbreaks have serious implications, healthwise and economically, for a community."

The Advisory Committee on Immunization Practices (ACIP) of the Centers for Disease Control and Prevention (CDC) states that to decrease the costs associated with outbreaks, vaccination of food handlers may be considered where it is deemed cost-effective.

Hepatitis A is a significant drain on the United States economy, costing the nation more than $450 million annually. According to the Hepatitis Control Report, the cost to the restaurant industry of the public announcements of Hepatitis A outbreaks related to restaurant operations has been estimated at more than $15 million annually.

APV Americas

New Quiet-running Colloid Mills from APV Set Standards for Control and Precision at Smaller Gap Settings

APV Americas –Homogenizer introduces a new generation of self-pumping, high-shear colloid mills designed to be the cleanest, quietest, most precise units of their kind, the company has announced.

APV Precision Plus colloid mills offer greater control and precision at smaller gap settings to help improve recipe management. Milling gap adjustments can be performed during operation from 0.001" to 0.050"+. Units include a choice of manual (rotary knob) or motorized adjustment. Motorized gap adjustment can be programmed and remotely controlled for data-logging to validate process operations. Seal flush water prevents thermally-induced changes to the milling gap.

In addition, operators can adjust rotor speed from 3.600 rpm (4.700 ft/min) to 7.200 rpm (9.400 ft/min). Residence time can be adjusted by valve restriction on discharge or by controlling the feed rate.

New Precision Plus colloid mills feature dynamically balanced totally enclosed liquid cooled (TELC) motors on production models, and totally enclosed non-vented motors on laboratory units. Dynamic balancing permits high speed operation while eliminating runout. Robust, angular contact ball bearings at the shaft end provide high thrust capacity, and smooth, cool running operation. The entire shaft and bearing assembly moves as a unit to adjust the milling gap. Noise levels are less than 75 dB.

High-performance three-stage milling head includes a toothed first stage which premacerates the product, forcing it into the milling gap for second-stage cavitation. The solid ungrooved third stage prevents passage of under- processed product. An efficient helical inducer assists the feed of viscous products – no feed pump is required. In addition, the Kinematic Scale-up principle maintains velocity relationships throughout the model range.

APV's proven double mechanical seal design features the same seal integrity as APV's W+ sanitary centrifugal pumps. Only two seal faces and two O-rings are in contact with the product at any time. The balanced design permits unpressurized liquid flush for contamination-free operation. Stationary load spring, outside the product area, helps ensure smooth operation at high rotational speeds.

APV Americas, Wilmington, MA

Reader Service No. 226

New "UVC Emitters™" Increase Product Shelf Life, Eliminate Microbial Contamination

A line of "UVC Emitter™" designed to eradicate the microbes that contaminate food and beverage products and sometimes shorten their shelf life has been introduced by Steril-Aire, Inc. Pilot installations of the UVC devices have yielded very promising results. For example, some produce packagers have successfully increased shelf life up to five days by exposing their products to UVC energy just prior to packaging, and bottled water companies have reduced or eliminated mold contamination by installing the lights in the plants' air handling systems.

For many decades, ultraviolet-C band ("UVC") germicidal lights have been used to kill harmful bacteria, mold and viruses in various comestible facilities and other applications. However, conventional UVC devices did not function effectively once mechanical ventilation arrived – and as a result, their usefulness in the food and beverage processing industries has been very limited in the recent past.

Unlike the conventional products of the past, the Steril-Aire designs borrow from recent laser technology to actually gain in efficiency ("killing power") when operated in moving air environments, even when the air is cold or freezing – providing effective and continuous eradication of mold, bacteria and phage (bacteria attacking viruses).

Many different fixture designs and a variety of tube lengths allow this unique product to be applied to almost any food application, from the packaging line to the air conditioning systems that serve the processing space. Virtually any type of comestible plant from bottled water to frozen foods can benefit from the use of UVC, especially since there is no secondary contamination from its use.

Steril-Aire, Inc., Cerritos, CA

Reader Service No. 227

LIGHTNING® INDEX™ PROFICIENCY PROGRAM

The *LIGHTNING* Index Proficiency Program was created to help food processors understand cleaning and sanitation trends within their facilities. As a result, plants utilizing this program are getting cleaner. The program gives participating companies feedback on cleaning effectiveness as compared to company and industry standards, allowing them to benchmark sanitation results. This service is provided without charge to *LIGHTNING* System users.

To participate, food processors send monthly data to IDEXX, which is used to prepare confidential and individual reports for each company. Reports track performance over time within the company, and document performance as compared to the industry.

An analysis of results is provided with each monthly report to help optimize use of the *LIGHTNING* System. This analysis will indicate any peformance problems and recommendations for corrective action. The program allows results criteria to be added at the user's request, which lets a company track changing performance against changes in crew, cleanser, product or process.

IDEXX Laboratories, Inc., Westbrook, ME

Reader Service No. 228

Hassia USA, Inc.

Hassia Improves Filling of Large Particulate Products in Pouches with Form/Fill/Seal Machines

The latest generation of Vertical Form-Fill-Seal technology from Hassia USA overcomes the challenge of filling pouches with pumpable food products containing large particulate products. The Hassia FVL family of form-fill-seal machines fills large particulate products into individual pouches. The FVL *16/48*, shown at the Worldwide Food Expo, can be flexible configured from 1-to-12 lanes. The FVL pouch machines, which include the 16/48 and 16/60 models, operate at speeds up to 100 cycles per minute, in some cases two to three times faster than other available equipment. Finished packages can range from 2-7 inches long (60 mm to 170 mm) and 1-9 inches wide (25 mm to 240 mm), and up to 7 fluid oz. (180 milliliters) in fill volume.

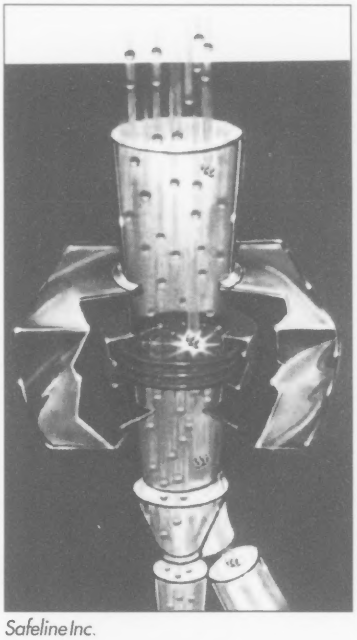
The FVL's servo-driven filler is capable of on-the-fly fill volume adjustment, and the filler is fully CIP-able without the need to disassemble the machine's filler or fill tubes. The Hassia FVL accommodates hot fill temperatures up to 90°C (200°F), for liquid and pumpable food products. Hassia's unique fill tube design handles products with large particulates up to 5/8 inches (15 mm) in diameter, making the FVL equipment ideal for pouches of chunky sauces and salsas in home meal replacement kits.

The FVL machines create 4-sided sealed pouches. A wide variety of sealing options can be used to produce pouches of unique sizes and shapes. An FVP family of machinery is also available for dry or powder products. The FVL's reciprocating sealing head operation aids in achieving high sealing pressures, and Hassia's Promecon® microprocessor controls assure precise adjustments for sealing temperature, time, and pressure, as well as offering the option of using pre-set memorized values for efficient product changeover.

The FVL family handles all standard laminate films and offers high output and efficiency. The large, 31.5 inch (800 mm) diameter packaging film reel will produce up to 1,000,000 pouches over a 2-shift operation without the necessity of a film reel change. The wrapping material feed and its centering device is installed near ground level for easy loading. An optional splicing table further improves efficiency by allowing for film roll change without a machine stop. The dual film roll feed option provides the potential to use two different films on different sides of the pouch. Front and back film registration in also offered as an option.

Hassia USA, Inc., Morganville

Reader Service No. 229



Safeline Inc.

Safeline Introduces POWERPHASE BP, Providing Improved Metal Detection Sensitivity to Bulk Processors

Safeline's new POWERPHASE BP range of metal detectors for bulk processing applications sports a completely new detector coil design as well as new signal processing electronics. The enhanced sensitivity of POWERPHASE BP extends to both difficult-to-detect conductive products as well as dry non-conductive bulk products, and includes excellent stainless steel metal contamination detection capabilities. The POWERPHASE BP range includes Safeline metal detectors in Pipeline models for inspecting liquids and gels, Gravity Feed models for inspecting powder/bulk products, and Zero Metal Free Zone models for inspecting products prior to bagger on horizontal or vertical form/fill/seal machines. In addition, multiple POWERPHASE BP metal detectors can be linked to a single P.C. with the powerful, new Windows-based SafeNet Plus network system for documentation and reporting.

Easily integrated into bulk processing production systems, POWERPHASE BP offers precise metal detection with such features as Multi-Frequency ability, Uniphase feature, and Enhanced Vibration & Noise Immunity. These features are designed to eliminate tramp metal contamination from all types of bulk products regardless of the production environment. POWERPHASE BP overcomes metal detection challenges presented by difficult-to-inspect and conductive products.

The Multi-Frequency capability enables a single metal detector to run products of differing conductivity on the same metal detector, while maximizing detection sensitivity for each product or compensating for variation on product conductivity. Ordinary metal detectors have the operating frequency set by the manufacturer to best match the customer's applications. POWERPHASE BP allows processors to select the operating frequency; this feature optimizes operations for production lines running multiple products. The Zero Metal Free Zone (ZMFZ) detector, used for inspecting snacks and bagged product as they drop to be packaged in form/fill/seal machinery can now take advantage of POWERPHASE BP's Multi-Frequency capability and inspect a greater range of products on a single machine.

Safeline's Uniphase feature eliminates the need for line operators to make adjustments in metal detector settings while inspecting multiple products. POWERPHASE BP reduces the product effect signal at its source, rather than relying solely on signal processing in the electronics. Pipeline metal detectors, used for inspecting liquids, gels, and slurries such as sausage meat or mashed potatoes, can have confidence that POWERPHASE BP will operate efficiently when inspecting liquid products, especially salty products such as meats.

Safeline Inc., Tampa, FL

Reader Service No. 230

IGEN Launches PATH*IGEN*™ *E. coli* O157 Test for Detection of Deadly Food Pathogen

IGEN International, Inc. has announced the launch of its PATH*IGEN*™ *E. coli* O157 Test. This is the first product launched by company's industrial business unit for food testing. Developed by the USDA's Agricultural Research Service (ARS) based on IGEN's patented ORIGEN® technology, the test has demonstrated an unprecedented level of sensitivity and precision in detecting this dangerous strain of the foodborne pathogen.

The new test for detecting *E. coli* O157, is a semi-automated method that offers rapid results and is estimated to be up to 100 times more sensitive than any other test on the market. Commonly used methods of detecting the dangerous pathogen in meat products often fail to pick up low levels of contamination. Existing detection methods also lead to a high number of false positives, often causing the unnecessary disposal of tons of ground beef.

Ultrasensitivity is a critical attribute because of the need to detect *E. coli* O157 at any level present in meat and other food products. We can have results from this new assay rapidly, while reducing the number of false positives and accurately detecting low levels of contamination in samples. This compares with 24 to 48 hours for traditional microbiological assay results.

E. coli O157 is a strain of the bacteria known to cause serious gastrointestinal illness, usually when encountered in contaminated ground beef that has not been properly cooked. Outbreaks

of *E. coli* O157-related illnesses have also been associated with the consumption of raw milk, tainted water and certain fruits and vegetables. Although symptoms of *E. coli* O157 infection typically disappear in 5-10 days, some people – especially the very young and elderly – may contract hemolytic uremic syndrome, which can result in kidney failure and even death. About 60,000 cases of *E. coli* O157 infection are reported each year in the US.

IGEN has a complementary panel of tests currently under development to more accurately and efficiently detect other food and water pathogens, including tests for *Salmonella, Listeria, Campylobacter* and *Cryptosporidium parvum*.

Earlier this year IGEN signed a Cooperative Research and Development Agreement (CRADA) with the USDA with the goal of adapting the new *E. coli* O157 test to a commercialized product, as well as developing other important food and beverage pathogen tests. The ARS' goal for the collaboration is to provide government regulatory agencies and commercial food processors with rapid methods to more accurately detect dangerous pathogens in public food and water supplies.

The PATH*IGEN* test represents the second product IGEN has commercialized in 1999. Earlier this year the company launched its new *M-SERIES™* System for use by biopharmaceutical companies in drug discovery and research.

IGEN International, Inc., Gaithersburg, MD

Reader Service No. 231

Low Volume, Short Lag-Time Sample Filters Available from Whatman, Inc.

Whatman introduces a new, line of Balston® stainless steel sample filters designed specifically to protect process analyzers and monitoring equipment.

The models 31S6, 31G, 41S6, 41G, and the 91S6 remove solids and liquids from gases with 99.99% efficiency at 0.01 µm, and solid particulate removal from liquids to .2 µm. These filters protect analyzers from sample impurities which are the most frequent cause of maintenance problems for instruments in an industrial environment.

These new filters are lower in cost than the Balston conventional stainless steel filter line. They are also more compact in design resulting in a smaller internal volume and faster sampling times.

The new improved design requires no tools to change the filters. Other design features include 1/2" NPT ports, maximum temperature of up to 400°F, and maximum pressure of up to 500 psig.

To satisfy the extremely wide range of requirements for analyzer sample filters, Whatman also supplies complete lines of Balston filter housings in teflon®, monel, and other corrosion-reisistant materials, plus a choice of high efficiency filter elements which are inert to virtually all liquids and gases.

Whatman Inc., Tewksbury, MA

Reader Service No. 232

Neogen Unveils Test for *Campylobacter*, Microwell Pathogen Tests

Neogen Corportion has added a test kit for the pathogen identified as the number one bacterial cause of domestic foodborne illness–*Campylobacter*. The rapid test for *Campylobacter* is one of two new test kits introduced by Neogen in a new test format for pathogens.

Neogen's new test kits, Alert for *Campylobacter* and Alert for *E. coli* O157, utilize superior antibodies to provide the quickest testing times available of any microwell enzyme-linked immunosorbent assay (ELISA). Alert for *E. coli* O157 requires only 35 minutes after enrichment, as compared to other microwell tests on the market that require 90 minutes or more. Similarly, Alert for *Campylobacter* requires only 50 minutes after enrichment by eliminating the time-consuming plating steps involved in conventional laboratory testing for the pathogen.

The addition of the *Campylobacter* test adds to Neogen's extensive line of rapid test kits to detect foodborne pathogens, which also includes kits for *E. coli* O157:H7, *Salmonella* and *Listeria*.

"The Alert test kits were designed for food processors and food labs who need quick turnaround testing times for a large number of samples," said Bill Hoerner, Neogen's diagnostic sales director. "These tests enable processors to quickly release product that has tested negative. That can make a big difference for most companies."

Campylobacter are found in the intestinal tracts of people and animals, but its most dangerous strain, *Campylobacter jejuni,* is most often associated with raw chicken. Since 1996, *Campylobacter* has been identified as the leading cause of bacterial diarrhea in the United States. The most common symptoms of *Campylobacter* infection, campylobacteriosis, are mild to severe diarrhea, fever, nausea, vomiting and abdominal pain. *Campylobacter* infection has also been linked with Guillain-Barré Syndrome, an autoimmune attack on the peripheral nerves that can cause weakness and paralysis.

When combined with Neogen's proprietary REVEAL 8-hour media, Alert for *E. coli* O157 allows testers to go from sample to results in only 9 hours. The Alert test kits include 96 antibody-coated microwells, allowing the testing of up to 94 samples per kit. An Alert test kit for *Salmonella* is in the final stages of development.

Neogen Corporation, Lansing, MI

Reader Service No. 233

Dairy, Food and Environmental Sanitation Instructions for Authors

NATURE OF THE MAGAZINE

Dairy, Food and Environmental Sanitation (*DFES*) is a monthly publication of the International Association for Food Protection. It is targeted for persons working in industry, regulatory agencies or teaching in milk, food and environmental protection.

The major emphases include:

- practical articles in milk, food and environmental protection;
- new product information;
- news from activities and individuals in the field;
- news of the Association affiliate groups and their members;
- 3-A Dairy and Egg Sanitary Standards, amendments and lists of symbol holders;
- excerpts of articles and information from other publications of interest to the readership.

Anyone with questions about the suitability of material for publication should contact the editor.

SUBMITTING ARTICLES AND OTHER MATERIALS

All manuscripts including, "Letters to the Editor" should be submitted in triplicate (original and two copies), in flat form (*not folded*), and by First Class mail to Donna Bahun, Production Editor, *DFES*, c/o International Association for Food Protection, 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2863, USA.

When possible, authors are encouraged to submit a fourth copy of their manuscript on computer disk. Manuscripts submitted on disk should be saved as an ASCII or rtf, or text formats.

All reading matter dealing with affairs of the Association or with news and events of interest to Members of the Association is published in *DFES*, and should be mailed to the above address. Correspondence dealing with advertising should also be sent to the address given above.

Correspondence regarding subscriptions or membership in the International Association for Food Protection should be sent to Julie Cattanach, Membership Services, (address above).

PUBLICATION OF MANUSCRIPTS

Manuscripts are accepted for publication only after they are reviewed by two members of the Editorial Board. Occasionally, when the subject of the paper is outside of the specialties of members of the Editorial Board, other specialists may be asked to review manuscripts. After review, a manuscript will be returned to the author by the Scientific Editor for revision in accordance with reviewers' suggestions. Three clean copies of the revised paper and a disk copy are to be returned to the editor as soon as possible. Authors can hasten publication of their papers by submitting well-written manuscripts conforming to the journal's style and by revising and returning manuscripts promptly. If, after review of a manuscript is completed, an author chooses to withdraw rather than revise the paper, the editor should be notified promptly. If an author does not respond in *four months* after a reviewed paper is returned, the paper will be considered as withdrawn. With authors' cooperation, articles are usually published within three to six months after they are received and may appear sooner.

When a manuscript is received, it is numbered, and the author is notified by mail that the manuscript has been received. The manuscript number will be given on the letter and should be used on all future correspondence and revised manuscripts. Authors will be notified when a manuscript has been accepted for publication.

Membership in the Association is not a prerequisite for acceptance of a manuscript.

Manuscripts, when accepted, become the copyrighted property of *DFES* and the International Association for Food Protection. Reprinting of any material from *DFES* or republishing of any papers or portions thereof is prohibited unless written permission to do so is granted by Donna Bahun, Production Editor.

Submission of a manuscript implies that all authors and their institutions have agreed to its publication. It is also implied that the paper is not being considered for publication in another domestic or foreign magazine or journal.

Authors are responsible for the accuracy of their papers. Neither *DFES* nor the Association assume responsibility for errors made by the authors. Furthermore, *DFES* and the International Association for Food Protection assume no responsibility for conclusions reached by authors, especially when products are evaluated.

Page proofs will be sent to authors prior to publication.

POLICY ON COMMERCIALISM

Manuscripts submitted for consideration for publication in *Dairy, Food and Environmental Sanitation* are not to be used as a platform for commercialism or the promotion of branded products or services. References to branded products or services except as may be warranted by scientific merit and research data or as are necessary for the understanding, evaluation and replication of the work described are to be avoided. However, scientific merit should not be diluted by proprietary secrecy. The excessive use of brand names, product names, logos or trade names, failure to substantiate performance claims, and the failure to objectively discuss alternative methods, processes, products and equipment may be considered indicators of commercialism. Disclosure and

acknowledgment of both funding sources and any conflicts of interest by the authors is encouraged. In general, the spirit and principles of the International Association for Food Protection Policy on Commercialism also apply to manuscripts submitted for consideration of publication in *Dairy, Food and Environmental Sanitation*. Restricting commercialism benefits the authors and the audience of *Dairy, Food and Environmental Sanitation*. The Scientific Editor shall in his or her sole discretion, determine whether a submitted manuscript violates this policy on commercialism.

TYPES OF ARTICLES

Readers of *DFES* include persons working in industry, regulatory agencies or teaching food safety. *DFES* publishes a variety of papers of interest to food safety professionals. The following types of articles and information are acceptable for publication in *DFES*.

General Interest

DFES regularly publishes nontechnical articles as a service to those readers who are not involved in the technical aspects of food safety. These articles include such topics as the organization and application of food control programs or quality control programs, ways of solving a particular problem in the field, organization and application of an educational program, management skills, use of visual aids and similar subjects. Often talks and presentations given at meetings of affiliate groups and other gatherings can be modified sufficiently to make them appropriate for publication. Authors planning to prepare general interest/nontechnical articles are invited to correspond with the Scientific Editor if they have questions about the suitability of their material.

Book Reviews

Authors and publishers of books relating to food safety are invited to submit their books to the Production Editor. Books will then be reviewed by a specialist in the field covered by the book, and the review will be published in an issue of *DFES*.

PREPARATION OF ARTICLES

The Scientific Editor assumes that the senior author has received proper clearance from his/her organization and from coauthors for publication of the manuscript.

All manuscripts should be typed double-spaced on 8-1/2 by 11 inch white bond paper. *Lines on each page should be numbered to facilitate review of the manuscripts. Manuscripts submitted on paper without numbered lines will be returned to authors.* Margins on all sides should be at least one-inch wide and pages of the original manuscript should not be stapled together.

A manuscript should be read critically by someone other than the author before it is submitted. If English is not the author's first language, the manuscript should be reviewed by a colleague of the author who is fluent in written English to ensure that correct English is used throughout the paper. *The editor and editorial staff will not rewrite papers when the English is inadequate.*

Authors are encouraged to consult previously published issues of *DFES* to obtain a clear understanding of the style of papers published.

Manuscripts should not be commercial in nature nor contain excessive use of brand names.

Revised manuscripts that do not require a second review should be printed on plain white bond paper *without* numbered lines or box outlines, etc. A copy of the revised manuscript should be included on a disk saved as an ASCII or rtf, or text formats.

ORGANIZATION OF ARTICLES

The title of the manuscript should appear at the top of the first page. It should be as brief as possible and contain no abbreviations. The title should be indicative of the subject of the manuscript. Avoid expressions such as "Effects of," "Influence of," "Studies on," etc.

Names of each author, and the name and address of the institution(s) where the work was done should appear on the title page. Footnotes can be used to give the current addresses of authors who are no longer at the institution(s) where the work was done. An *asterisk* should be placed after the name of the author to whom correspondence about the paper and proofs should be sent. The telephone and facsimile numbers of this author should be given at the bottom of the page. No text of the manuscript should appear on the title page.

The Abstract should appear on a separate piece of paper directly following the title page, and should not exceed 200 words. It should summarize the contents of the manuscript, and be meaningful without having to read remaining pages. The Abstract should *not* contain references, diagrams, tables or unusual abbreviations.

The references should be arranged in alphabetical order, by last name of first author and numbered consecutively. Only the first author's name and initial should be inverted. *Cite each reference in the text by number.* All references given in the list must be cited in the text. List references according to the style of the following examples.

Paper in journal

Alberman, G. G. and E. H. Marth. 1974. Experimental production of aflatoxin in citrus juice and peel. J. Milk Food Technol. 37:308-313.

Paper in book

Marth, E. H. 1974. Fermentations. p. 771-882. *In* B. H. Webb, A. H. Johnson and J. A. Alford. (eds.). Fundamentals of dairy chemistry. 2nd ed. AVI Publishing Co., Westport, CT.

Book by author(s)

Minor, T. E. and E. H. Marth. 1976. Staphylococci and their significance in foods. Elsevier Scientific Publishing Co., Amsterdam.

Book by editor(s)

Vanderzant, C. and D. F. Splittstoesser. (eds.). 1992. Compendium of methods for the microbiological examination of foods. 3rd ed. American Public Health Association, Washington, D.C.

Patent

Hussong, R. V., E. H. Marth and D. G. Vakaleris. 1964. Manufacture of cottage cheese. U.S. Pat. 3,117,870. Jan. 14.

Publication with no identifiable author or editor

Anonymous. 1977. Thermally processed low-acid foods in hermetically sealed containers. Code of Federal Regulations No. 21, U.S. Government Printing Office, Washington, D.C.

References citing "personal communication" or "unpublished data" are discouraged, although it is recognized that sometimes it is unavoidable. An author may be asked to provide evidence of such references.

References consisting of papers that are "accepted for publication" or "in press" are acceptable, but the author may be asked to provide copies of such papers if needed to evaluate the manuscript in question.

Figures and tables should appear on separate pages and not within the text of the manuscript. Placement of tables and figures should be indicated in the text.

ILLUSTRATIONS, PHOTOGRAPHS, FIGURES

Submission of photographs, graphics or drawings to illustrate the article will help the article. The nature of *DFES* allows liberal use of such illustrations, and interesting photographs and drawings often increase the number of persons who read the article.

Photographs. Photographs which are submitted should have sharp images, with good contrast. Photographs can be printed in color, but the additional cost of doing so must be borne by the author. Authors wishing to publish color photographs should contact Donna Bahun, Production Editor for cost estimates.

The editor encourages the submission of four-color photographs to be used on the cover of *DFES*. Photographs should depict a scene relative to food safety. Please submit your photograph in the form of a negative or slide. Cover photographs will be returned only upon request.

Line drawings. All line drawings (graphs, charts, diagrams, etc.) should be submitted as black and white glossy or matte finish photographs. Use a lettering set or other suitable device for all labeling. If graphs are computer generated, printed copies of the graphs must be produced by a good quality laser printer, with sufficiently dark printing or appropriate size letters and numerals. Graphs produced by dot matrix printers *are not* acceptable. Figures are commonly reduced to a 1-column width (85 mm). Lettering should be of sufficient size to allow for reduction. If symbols are used, they must be identified on the Figure and not in the legend. Data that are presented in Figures should not be repeated in Tables. A well-prepared Figure should be understandable without reference to the text of the paper.

Labeling of figures. All Figures should be labeled lightly on back, using a soft pencil or a typed adhesive label. Labeling should include:

- figure number,
- last name of author(s),
- title of manuscript,
- the manuscript number (on revised copies),
- identification of the top of the figure.

COMMON ABBREVIATIONS

Frequently used acceptable abbreviations may be used (i.e., using *wt* for the word *weight*, or *s* for the word *second*). For further details on abbreviations see the current edition of the *CBE Style Manual* or *ASM Manual of Style*. Note that a period is used with some but not all abbreviations.

Authors may also contact the Production Editor if they are not sure about acceptable abbreviations.

REPRINTS

Reprints of an article may be ordered by the author. An order form for reprints will be sent to the corresponding author. Reprints may be ordered with or without covers, in multiples of 100. Reprint costs vary according to the number of printed pages in the article.

Reprints cannot be provided free of charge. Reprints are ordered through the International Association for Food Protection, 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2863, USA.

Audiovisual Library

DAIRY

D1170 3-A Symbol Council—(8 minute videotape). A video which was developed to make people in the dairy and food industries aware of the 3-A program and its objectives.

D1180 10 Points to Dairy Quality—(10 minute videotape). Provides in-depth explanation of a critical control point in the residue prevention protocol. Illustrated with on-farm, packing plant, and milk-receiving plant scenes as well as interviews of producers, practicing veterinarians, regulatory officials and others. (Dairy Quality Assurance-1992) (Rev. 1998)

D1010 The Bulk Milk Hauler: Protocol & Procedures—(8 minute videotape). Teaches bulk milk haulers how they contribute to quality milk production. Special emphasis is given to the hauler's role in proper milk sampling, sample care procedures, and understanding test results. (Iowa State University Extension-1990). (Rev. 1998)

D1020 Causes of Milkfat Test Variations & Depressions—(30 minute-140 slides-tape-script). This set illustrates the many factors involved in causing milkfat test variations or depressions in your herd, including feeding, management, stage of lactation, age of samples, handling of samples, and testing procedures. The script was reviewed by field staff, nutritionists, laboratory personnel and county extension staff. It is directed to farmers, youth and allied industry. (Penn State-1982)

D1030 Cold Hard Facts—This video is recommended for training personnel associated with processing, transporting, warehousing, wholesaling and retailing frozen foods. It contains pertinent information related to good management practices necessary to ensure high quality frozen foods. (National Frozen Food Association-1993) (Rev. 1998)

D1040 Ether Extraction Method for Determination of Raw Milk—(26 minute videotape). Describes the ether extraction procedure to measure milkfat in dairy products. Included is an explanation of the chemical reagents used in each step of the process. (CA-1988) (Rev. 1998)

D1050 The Farm Bulk Milk Hauler—(30 minute-135 slides-tape-script). This set covers the complete procedure for sampling and collecting milk from farms. Each step is shown as it starts with the hauler entering the farm lane and ends when he leaves the milk house. Emphasis is on universal sampling and automated testing. Funds to develop this set were provided by The Federal Order #36 Milk Market Administrator. (Penn State-1982) (Rev. 1998)

D1060 Frozen Dairy Products—(27 minute videotape). Developed by the California Department of Food and Agriculture. Although it mentions the importance of frozen desserts, safety and checking ingredients; emphasis is on what to look for in a plant inspection. Everything from receiving, through processing and cleaning and sanitizing is outlined, concluded with a quality control program. Directed to plant workers and supervisors, it shows you what should be done. (CA-1987) (Rev. 1997)

D1070 The Gerber Butterfat Test—(7 minute videotape). Describes the Gerber milkfat test procedure for dairy products and compares it to the Babcock test procedure. (CA-1990) (Rev. 1998)

D1080 High-Temperature, Short-Time Pasteurizer—(59 minute videotape). Provided by the Dairy Division of Borden, Inc. It was developed to train pasteurizer operators and is well done. There are seven sections with the first covering the twelve components of a pasteurizer and the purpose and operation of each. The tape provides the opportunity for discussion after each section or continuous running of the videotape. Flow diagrams, processing and cleaning are covered. (Borden, Inc.-1986) (Rev. 1997)

D1100 Mastitis Prevention and Control—(2-45 minute videotapes). This video is ideal for one-on-one or small group presentations. Section titles include: Mastitis Pathogens, Host Defense, Monitoring Mastitis, Mastitis Therapy, Recommended Milking Procedures, Postmilking Teat Dip Protocols, Milk Quality, Milking Systems. (Nasco-1993)

D1110 Milk Plant Sanitation: Chemical Solution—(13 minute videotape). This explains the proper procedure required of laboratory or plant personnel when performing chemical titration in a dairy plant. Five major titrations are reviewed... alkaline wash, presence of chlorine and iodophor, and caustic wash and an acid wash in a HTST system. Emphasis is also placed on record keeping and employee safety. (1989)

D1120 Milk Processing Plant Inspection Procedures—(15 minute videotape). Developed by the California Department of Food and Agriculture. It covers pre- and post- inspection meeting with management, but emphasis is on inspection of all manual and cleaned in place equipment in the receiving, processing and filling rooms. CIP systems are checked along with recording charts and employee locker and restrooms. Recommended for showing to plant workers and supervisors. (CA-1986)

D1130 Pasteurizer - Design and Regulation—(16 minute videotape). This tape provides a summary of the public health reasons for pasteurization and a nonlegal definition of pasteurization. The components of an HTST pasteurizer, elements of design, flow-through diagram and legal controls are discussed. (Kraft General Foods-1990) (Rev. 1998)

D1140 Pasteurizer - Operation—(11 minute videotape). This tape provides a summary of the operation of an HTST pasteurizer from start-up with hot water sanitization to product pasteurization and shut-down. There is an emphasis on the legal documentation required. (Kraft General Foods-1990) (Rev. 1998)

D1150 Processing Fluid Milk—(30 minute-140 slides-script-tape). It was developed to train processing plant personnel on preventing food poisoning and spoilage bacteria in fluid dairy products. Emphasis is on processing procedures to meet federal regulations and standards. Processing procedures, pasteurization times and temperatures, purposes of equipment, composition standards, and cleaning and sanitizing are covered. Primary emphasis is on facilities such as drains and floors, and filling equipment to prevent post-pasteurization contamination with spoilage or food poisoning bacteria. It was reviewed by many industry plant operators and regulatory agents and is directed to plant workers and management. (Penn State-1987) (Rev. 1998)

ENVIRONMENTAL

E3010 The ABCs of Clean-A Handwashing & Cleanliness Program for Early Childhood Programs—For early childhood program employees. This tape illustrates how proper handwashing and clean hands can contribute to the infection control program in daycare centers and other early childhood programs. (The Soap & Detergent Association-1991)

E3020 Acceptable Risks?—(16 minute videotape). Accidents, deliberate misinformation, and the rapid proliferation of nuclear power plants have created increased fears of improper nuclear waste disposal, accidents during the transportation of waste, and the release of radioactive effluents from plants. The program shows the occurrence of statistically anomalous leukemia clusters; governmental testing of marine organisms and how they absorb radiation; charts the kinds and amounts of natural and man-made radiation to which man is subject; and suggests there is no easy solution to balancing our fears to nuclear power and our need for it. (Films for the Humanities & Sciences, Inc.-1993) (Rev. 1998)

E3030 Air Pollution: Indoor—(26 minute videotape). Indoor air pollution is in many ways a self-induced problem...which makes it no easier to solve. Painting and other home improvements have introduced pollutants, thermal insulation and other energy-saving and water-proofing devices have trapped the pollutants inside. The result is that air pollution inside a modern home can be worse than inside a chemical plant. (Films for the Humanities & Sciences, Inc.) (Rev. 1998)

E3040 Asbestos Awareness—(20 minute videotape). This videotape discusses the major types of asbestos and their current and past uses. Emphasis is given to the health risks associated with asbestos exposure and approved asbestos removal abatement techniques. (Industrial Training, Inc.-1988) (Rev. 1998)

E3055 Effective Handwashing-Preventing Cross-Contamination in the Food Service Industry—(3 1/2 minute videotape). It is critical that all food service workers wash their hands often and correctly. This video discusses the double wash method and the single wash method and when to use each method. (Zep Manufacturing Company-1993)

E3060 **EPA Test Methods for Freshwater Effluent Toxicity Tests (Using Ceriodaphnia)**–(22 minute videotape). Demonstrates the Ceriodaphnia 7-Day Survival and Reproduction Toxicity Test and how it is used to monitor and evaluate effluents for their toxicity to biota and their impact on receiving waters and the establishment of NPDES permit limitations for toxicity. The tape covers the general procedures for the test including how it is set up, started, monitored, renewed and terminated. (1989) (Rev. 1998)

E3070 **EPA Test Methods for Freshwater Effluent Toxicity Tests (Using Fathead Minnow Larva)**–(15 minute videotape). A training tape that teaches environmental professionals about the Fathead Minnow Larval Survival and Growth Toxicity Test. The method described is found in an EPA document entitled, "Short Term Methods for Estimating the Chronic Toxicity of Effluents & Receiving Waters to Freshwater Organisms." The tape demonstrates how fathead minnow toxicity tests can be used to monitor and evaluate effluents for their toxicity to biota and their impact on receiving waters and the establishment of NPDES permit limitations for toxicity. (1989) (Rev. 1998)

E3080 **Fit to Drink**–(20 minute videotape). This program traces the water cycle, beginning with the collection of rain-water in rivers and lakes, in great detail through a water treatment plant, to some of the places where water is used, and finally back into the atmosphere. Treatment of the water begins with the use of chlorine to destroy organisms; the water is then filtered through various sedimentation tanks to remove solid matter. Other treatments employ ozone, which oxidizes contaminants and makes them easier to remove; hydrated lime, which reduces the acidity of the water; sulfur dioxide, which removes any excess chlorine; and floculation, a process in which aluminum sulfate causes small particles to clump together and precipitate out. Throughout various stages of purification, the water is continuously tested for smell, taste, titration, and by fish. The treatment plant also monitors less common contaminants with the use of up-to-date techniques like flame spectrometers and gas liquefaction. (Films for the Humanities & Sciences, Inc.-1987)

E3110 **Garbage: The Movie**–(25 minute videotape). A fascinating look at the solid waste problem and its impact on the environment. Viewers are introduced to landfills, incinerators, recycling plants and composting operations as solid waste management solutions. Problems associated with modern landfills are identified and low-impact alternatives such as recycling, reuse, and source reduction are examined. (Churchill Films) (Rev. 1998)

E3120 **Global Warming: Hot Times Ahead**–(23 minute videotape). An informative videotape program that explores the global warming phenomenon and some of the devastating changes it may cause. This program identifies greenhouse gases and how they are produced by human activities. Considered are: energy use in transportation, industry and home; effects of deforestation, planting of trees and recycling as means of slowing the build-up of greenhouse gases. (Churchill Films-1995)

E3130 **Kentucky Public Swimming Pool & Bathing Facilities**–(38 minute videotape). Developed by the Lincoln Trail District Health Department in Kentucky and includes all of their state regulations which may be different from other states, provinces and countries. This tape can be used to train those responsible for operating pools and waterfront bath facilities. All aspects are included of which we are aware, including checking water conditions and filtration methods. (1987). (Rev. 1998)

E3135 **Plastics Recycling Today: A Growing Resource**–(11:35 minute videotape). Recycling is a growing segment of our nation's solid waste management program. This video shows how plastics are handled from curbside pickup through the recycling process to end-use by consumers. This video provides a basic understanding of recycling programs and how communities, companies and others can benefit from recycling. (The Society of the Plastics Industry, Inc.-1988)

E3140 **Putting Aside Pesticides**–(26 minute videotape). This program probes the long-term effects of pesticides and explores alternative pest-control efforts; biological pesticides, genetically-engineered microbes that kill objectionable insects, the use of natural insect predators, and the cross-breeding and genetic engineering of new plant strains that produce their own anti-pest toxins. (Films for the Humanities & Sciences, Inc.) (Rev. 1999)

E3150 **Radon**–(26 minute videotape). This program looks at the possible health implications of radon pollution, methods homeowners can use to detect radon gas in their homes, and what can be done to minimize hazards once they are found.

E3160 **RCRA–Hazardous Waste**–(19 minute videotape). This videotape explains the dangers associated with hazardous chemical handling and discusses the major hazardous waste handling requirements presented in the Resource Conservation and Recovery Act. (Industrial Training, Inc.)

The New Superfund. What It is & How It Works–A six-hour national video conference sponsored by the EPA. Target audiences include the general public, private industry, emergency responders and public interest groups. The series features six videotapes that review and highlight the following issues:

E3170 **Tape 1–Changes in the Remedial Process: Clean-up Standards and State Involvement Requirements**–(62 minute videotape). A general overview of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and the challenge of its implementation. The remedy process–long-term and permanent cleanup-is illustrated step-by-step, with emphasis on the new mandatory clean-up schedules, preliminary site assessment petition procedures and the hazard ranking system/National Priority List revisions. The major role of state and local government involvement and responsibility is stressed.

E3180 **Tape 2–Changes in the Removal Process: Removal and Additional Program Requirements**–(48 minute videotape). The removal process is a short-term action and usually an immediate response to accidents, fires and illegal dumped hazardous substances. This program explains the changes that expand removal authority and require procedures consistent with the goals of remedial action.

E3190 **Tape 3–Enforcement & Federal Facilities**–(52 minute videotape). Who is responsible for SARA clean-up costs? Principles of responsible party liability; the difference between strict, joint and several liability; and the issue of the innocent land owner are discussed. Superfund enforcement tools-mixed funding, De Minimis settlements and the new nonbinding preliminary allocations of responsibility (NBARs) are explained.

E3210 **Tape 4–Emergency Preparedness & Community Right-to-Know**–(48 minute videotape). A major part of SARA is a free-standing act known as Title III: The Emergency Planning and Community Right-to-Know Act of 1986, requiring federal, state, and local governments and industry to work together in developing local emergency preparedness/response plans. This program discusses local emergency planning committee requirements, emergency notification procedures, and specifications on community right-to-know reporting requirements such as using OSHA Material Safety Data Sheets, the emergency & hazardous chemical inventory and the toxic chemical release inventory.

E3220 **Tape 5–Underground Storage Tank Trust Fund & Response Program**–(21 minute videotape). Another addition to SARA is the Leaking Underground Storage Tank (LUST) Trust Fund. One half of the US population depends on ground water for drinking–and EPA estimates that as many as 200,000 underground storage tanks are corroding and leaking into our ground water. This program discusses how the LUST Trust Fund will be used by EPA and the states in responding quickly to contain and clean-up LUST releases. Also covered is state enforcement and action requirements, and owner/operator responsibility.

E3230 **Tape 6–Research & Development/Closing Remarks**–(33 minute videotape). An important new mandate of the new Superfund is the technical provisions for research and development to create more permanent methods in handling and disposing of hazardous wastes and managing hazardous substances. This segment discusses the SITE (Superfund Innovative Technology Evaluation) program, the University Hazardous Substance Research Centers, hazardous substance health research and the DOD research, development and demonstration management of DOD wastes.

E3240 **Sink A Germ**—(10 minute videotape). A presentation on the rationale and techniques for effective handwashing in health care institutions. Uses strong imagery to educate hospital personnel that handwashing is the single most important means of preventing the spread of infection. (The Brevis Corp.-1986). (Rev. 1998)

E3245 **Wash Your Hands**—(5 minute videotape). Handwashing is the single most important means of preventing the spread of infection. This video presents why handwashing is important and the correct way to wash your hands. (LWB Company-1995)

E3250 **Waste Not: Reducing Hazardous Waste**—(35 minute videotape). This tape looks at the progress and promise of efforts to reduce the generation of hazardous waste at the source. In a series of company profiles, it shows activities and programs within industry to minimize hazardous waste in the production process. Waste Not also looks at the obstacles to waste reduction, both within and outside of industry, and considers how society might further encourage the adoption of pollution prevention, rather than pollution control, as the primary approach to the problems posed by hazardous waste. (Umbrella films)

FOOD

F2260 **100 Degrees of Doom... The Time & Temperature Caper**—(14 minute videotape). Video portraying a private eye tracking down the cause of a *Salmonella* poisoning. Temperature control is emphasized as a key factor in preventing foodborne illness. (Educational Communications, Inc.-1987) (Rev. 1998)

F2440 **Cleaning & Sanitizing in Vegetables Processing Plants: Do It Well, Do It Safely!**—(16 minute videotape) This training video shows how to safely and effectively clean and sanitize in a vegetable processing plant. It teaches how it is the same for processing plant as it is for washing dishes at home. (University of Wisconsin Extension-1996) (Available in Spanish)

F2010 **Close Encounters of the Bird Kind**—(18 minute videotape). A humorous but in-depth look at *Salmonella* bacteria, their sources, and their role in foodborne disease. A modern poultry processing plant is visited, and the primary processing steps and equipment are examined. Potential sources of *Salmonella* contamination are identified at the different stages of production along with the control techniques that are employed to insure safe poultry products. (Topek Products, Inc.) (Rev. 1998)

F2037 **Cooking and Cooling of Meat and Poultry Products**—(2 videotapes - 176 minutes). (See Part 1 Tape F2035 and Part 2 Tape F2036). This is session 3 of a 3-part Meat and Poultry Teleconference cosponsored by AFDO and the USDA Food Safety Inspection Service. Upon completion of viewing these videotapes, the viewer will be able to (1) recognize inadequate processes associated with the cooking and cooling of meat and poultry at the retail level; (2) Discuss the hazards associated with foods and the cooking and cooling processes with management at the retail level; (3) Determine the adequacy of control methods to prevent microbiological hazards in cooking and cooling at the retail level, and (4) Understand the principle for determining temperature with various temperature measuring devices. (AFDO/USDA-1999)

F2030 **"Egg Games" Foodservice Egg Handling and Safety**—(18 minute videotape). Develop an effective egg handling and safety program that is right for your operation. Ideal for manager training and foodservice educational programs, this video provides step-by-step information in an entertaining, visually-exciting format. (American Egg Board-1999)

F2020 **Egg Handling & Safety**—(11 minute videotape). Provides basic guidelines for handling fresh eggs which could be useful in training regulatory and industry personnel. (American Egg Board-1997)

F2036 **Emerging Pathogens and Grinding and Cooking Comminuted Beef**—(2 videotapes - 165 minutes.) (See Part 1 Tape F2035 and Part 3 Tape F2037.) This is session 2 of a 3-part Meat and Poultry Teleconference cosponsored by AFDO and the USDA Food Safety Inspection Service. These videotapes present an action plan for federal, state, local authorities, industry, and trade associations in a foodborne outbreak. (AFDO/USDA-1998)

F2035 **Fabrication and Curing of Meat and Poultry Products**—(2 videotapes - 145 minutes). (See Part 2 Tape F2036 and Part 3 Tape F2037). This is session 1 of a 3-part Meat and Poultry Teleconference cosponsored by AFDO and the USDA Food Safety Inspection Service. Upon viewing, the sanitarian will be able to (1) Identify typical equipment used for meat and poultry fabrication at retail and understand their uses; (2) Define specific terms used in fabrication of meat and poultry products in retail establishments, and (3) Identify specific food safety hazards associated with fabrication and their controls. (AFDO/USDA-1997)

F2040 **Food Irradiation**–(30 minute videotape). Introduces viewers to food irradiation as a new preservation technique. Illustrates how food irradiation can be used to prevent spoilage by microorganisms, destruction by insects, overripening, and to reduce the need for chemical food additives. The food irradiation process is explained and benefits of the process are highlighted. (Turnelle Productions, Inc.) (Rev. 1998)

F2045 **Food Microbiological Control**–(6-videotapes - appoximate time 12 hours). Designed to provide information and demonstrate the application of basic microbiology, the Good Manufacturing Practices (GMPs), retail Food Code, and sanitation practices when conducting food inspections at the processing and retail levels. Viewers will enhance their ability to identify potential food hazards and evaluate the adequacy of proper control methods for these hazards. (FDA-1998)

F2050 **Food Safe-Food Smart-HACCP & Its Application to the Food Industry**–(2-16 minute videotapes). (1)-Introduces the seven principles of HACCP and their application to the food industry. Viewers will learn about the HACCP system and how it is used in the food industry to provide a safe food supply. (2)-Provides guidance on how to design and implement a HACCP system. It is intended for individuals with the responsibility of setting up a HACCP system. (Alberta Agriculture, Food and Rural Development) (Rev. 1998)

F2060 **Food Safe-Series I**–(4-10 minute videotapes). (1) "Receiving & Storing Food Safely," details for food-service workers the procedures for performing sight inspections for the general conditions of food, including a discussion of food labeling and government approval stamps. (2) "Food-service Facilities and Equipment," outlines the requirements for the proper cleaning and sanitizing of equipment used in food preparation areas. Describes the type of materials, design, and proper maintenance of this equipment. (3) "Microbiology for Food-service Workers," provides a basic understanding of the microorganisms which cause food spoilage and foodborne illness. This program describes bacteria, viruses, protozoa, and parasites and the conditions which support their growth. (4) "Food-service Housekeeping and Pest Control," emphasizes cleanliness as the basis for all pest control. Viewers learn the habits and life cycles of flies, cockroaches, rats, and mice. (Perennial Education-1991) (Rev. 1998)

F2070 **Food Safe—Series II**–(4-10 minute videotapes). Presents case histories of foodborne disease involving (1) *Staphylococcus aureus,* (sauces) (2) *Salmonella,* (eggs) (3) *Campylobacter,* and (4) *Clostridium botulinum.* Each tape demonstrates errors in preparation, holding or serving food; describes the consequences of those actions; reviews the procedures to reveal the cause of the illness; and illustrates the correct practices in a step-by-step demonstration. These are excellent tapes to use in conjunction with hazard analysis critical control point training programs. (Perennial Education-1991) (Rev. 1998)

F2080 **Food Safe—Series III**–(4-10 minute videotapes). More case histories of foodborne disease. This set includes (1) Hepatitis "A", (2) *Staphylococcus aureus* (meats), (3) *Bacillus cereus*, and (4) *Salmonella* (meat). Viewers will learn typical errors in the preparation, holding and serving of food. Also included are examples of correct procedures which will reduce the risk of food contamination. (Perennial Education-1991) (Rev. 1998)

F2133 **Food Safety First**–(50 minute videotape). This food safety training video presents causes of foodborne illness in foodservice and ways to prevent foodborne illness. Individual segments include personal hygiene and handwashing, cleaning and sanitizing, preventing cross contamination and avoiding time and temperature abuse. Foodhandling principles are presented through scenarios in a restaurant kitchen. (Glo-Germ 1998)

F2090 **Food Safety: An Educational Video for Institutional Food-Service Workers**–(10 minute videotape). Provides a general discussion on food safety principles with special emphasis on pathogen reductions in an institutional setting from child care centers to nursing homes. (U.S. Department of Health & Human Services-1997)

F2120 **Food Safety: For Goodness Sake, Keep Food Safe**–(15 minute videotape). Teaches foodhandlers the fundamentals of safe food handling. The tape features the key elements of cleanliness and sanitation, including: good personal hygiene, maintaining proper food product temperature, preventing time abuse, and potential sources of food contamination. (Iowa State University Extension-1990) (Rev. 1998)

F2110 **Food Safety is No Mystery**–(34 minute videotape). This is an excellent training visual for food-service workers. It shows the

proper ways to prepare, handle, serve and store food in actual restaurant, school and hospital situations. A policeman sick from food poisoning, a health department sanitarian, and a food-service worker with all the bad habits are featured. The latest recommendations on personal hygiene, temperatures, cross-contamination, and storage of foods are included. (USDA-1987). Also available in Spanish. – (Rev. 1998)

F2130 **Food Safety: You Make the Difference**–(28 minute videotape). Through five food workers from differing backgrounds, this engaging and inspirational documentary style video illustrates the four basic food safety concepts: handwashing, preventing cross-contamination, moving foods quickly through the danger zone, and hot/cold holding (Seattle-King County Health Department-1995)

F2140 **GMP Basics — Employee Hygiene Practices**–(20 minute videotape). Through real-life examples and dramatization, this video demonstrates good manufacturing practices that relate to employee hygiene, particularly hand washing. This video includes a unique test section to help assess participants' understanding of common GMP violations. (Silliker Laboratories-1997)

F2143 **GMP Basics: Guidelines for Maintenance Personnel**–(21 minute videotape). Developed specifically for maintenance personnel working in a food processing environment, this video depicts a plant-wide training initiative following a product recall announcment. Maintenance personnel will learn how GMPs relate to their daily activities and how important their roles are in the production of safe food products. (Silliker Laboratories-1999)

F2148 **GMP–GSP Employee**-(38 minute videotape). This video was developed to teach food plant employees the importance of "Good Manufacturing Practices" and "Good Sanitation Practices." Law dictates that food must be clean and safe to eat. This video emphasizes the significance of each employee's role in protecting food against contamination. Tips on personal cleanliness and hygiene are also presented. (L.J. Bianco & Associates)

F2150 **GMP: Personal Hygiene & Practices in Food Manufacturing**–(14 minute videotape). This video focuses on the personal hygiene of food-manufacturing workers, and explores how poor hygiene habits can be responsible for the contamination of food in the manufacturing process. This is an instructional tool for new food-manufacturing line employees and supervisors. It was produced with "real" people in actual plant situations, with only one line of text included in the videotape. (Penn State-1993)-(Available in Spanish and Vietnamese)

F2147 **GMP Basics: Process Control Practices**–(16 minute videotape). In actual food processing environments, an on-camera host takes employees through a typical food plant as they learn the importance of monitoring and controlling key points in the manufacturing process. Beginning with receiving and storing, through production, and ending with packaging and distribution, control measures are introduced, demonstrated, and reviewed. Employees will see how their everyday activities in the plant have an impact on product safety. (Silliker Laboratories-1999)

F2160 **GMP: Sources & Control of Contamination during Processing**–(20 minute videotape). This program, designed as an instructional tool for new employees and for refresher training for current or reassigned workers, focuses on the sources and control of contamination in the food-manufacturing process. It was produced in actual food plant situations. A concise description of microbial contamination and growth and cross-contamination, a demonstration of food storage, and a review of aerosol contaminants are also included. (Penn State-1995)

F2135 **Get with a Safe Food Attitude**–(40 minute videotape). Consisting of nine short segments which can be viewed individually or as a group, this video presents safe food handling for moms-to-be. Any illness a pregnant women contracts can affect her unborn child whose immune system is too immature to fight back. The video follows four pregnant women as they learn about food safety and preventing foodborne illness. (US Department of Agriculture-1999)

F2165 **HACCP and Its Application to the Food Industry**–(2-17 minute videotapes). Looking to develop a comprehensive food-safety and quality control program for your organization? Part one introduces the concept of the HACCP system and the seven principles behind it. Part two takes the viewer through each of the 12 stages in setting up such a system. (Alberta Agriculture-1993) (Rev. 1999)

F2180 **HACCP: Safe Food Handling Techniques**–(22 minute videotape). The video highlights the primary causes of food poisoning and emphasizes the importance of self-inspection. An explanation of potentially hazardous foods, cross-contamination, and temperature control is provided. The main focus is a detailed description of how to implement a Hazard Analysis Critical Control Point (HACCP) program in a foodservice operation. A leader's guide is provided as an adjunct to the tape. (The Canadian Restaurant & Food-services Association-1990) (Rev. 1998)

F2170 **The Heart of HACCP**–(22 minute videotape). A training video designed to give plant personnel a clear understanding of the seven HACCP principles and practical guidance on how to apply these principles to their own work environment. This video emphasizes the principles of primary concern to plant personnel such as critical limits, monitoring systems, and corrective actions that are vital to the success of a HACCP plan. (Silliker Laboratories Group-1994)

F2175 **Inspecting For Food Safety-Kentucky's Food Code**–(100 minute videotape). Kentucky's Food Code is patterned after the Federal Food Code. The concepts, definitions, procedures, and regulatory standards included in the code are based on the most current information about how to prevent foodborne diseases. This video is designed to prepare food safety inspectors to effectively use the new food code in the performance of their duties. (Department of Public Health Commonwealth of Kentucky-1997) (Rev. 1999)

F2190 **Is What You Order What You Get? Seafood Integrity**–(18 minute videotape). Teaches seafood department employees about seafood safety and how they can help insure the integrity of seafood sold by retail food markets. Key points of interest are cross-contamination control, methods and criteria for receiving seafood and determining product quality, and knowing how to identify fish and seafood when unapproved substitutions have been made. (The Food Marketing Institute) (Rev. 1998)

F2210 **Northern Delight–From Canada to the World**–(13 minute videotape). A promotional video that explores the wide variety of foods and beverages produced by the Canadian food industry. General in nature, this tape presents an overview of Canada's food industry and its contribution to the world's food supply. (Ternelle Production, Ltd.) (Rev. 1998)

F2240 **On the Front Line**–(18 minute videotape). A training video pertaining to sanitation fundamentals for vending service personnel. Standard cleaning and serving procedures for cold food, hot beverage and cup drink vending machines are presented. The video emphasizes specific cleaning and serving practices which are important to food and beverage vending operations. (National Automatic Merchandising Association-1993) (Rev. 1998)

F2250 **On the Line**–(30 minute videotape). This was developed by the Food Processors Institute for training food processing plant employees. It creates an awareness of quality control and regulations. Emphasis is on personal hygiene, equipment cleanliness and good housekeeping in a food plant. It is recommended for showing to both new and experienced workers. (Available in Spanish) The Food Processors Institute. 1993. (Rev. 1998)

F2270 **Pest Control in Seafood Processing Plants**–(26 minute videotape). Videotape which covers procedures to control flies, roaches, mice, rats and other common pests associated with food processing operations. The tape will familiarize plant personnel with the basic characteristics of these pests and the potential hazards associated with their presence in food operations. (Rev. 1998)

F2280 **Principles of Warehouse Sanitation**–(33 minute videotape). This videotape gives a clear, concise and complete illustration of the principles set down in the Food, Drug and Cosmetic Act and in the Good Manufacturing Practices, as well as supporting legislation by individual states. (American Institute of Baking-1993)

F2290 **Product Safety & Shelf Life**–(40 minute videotape). Developed by Borden Inc., this videotape was done in three sections with opportunity for review. Emphasis is on providing consumers with good products. One section covers off-flavors, another product problems caused by plant conditions, and a third the need to keep products cold and fresh. Procedures to assure this are outlined, as shown in a plant. Well done and directed to plant workers and supervisors. (Borden-1987) – (Rev. 1997)

F2220 **Proper Handling of Peracidic Acid**–(15 minute videotape). Introduces paracidic acid as a chemical sanitizer and features the various precautions needed to use the product safely in the food industry.

F2230 **Purely Coincidental**—(20 minute videotape). A parody that shows how foodborne illness can adversely affect the lives of families that are involved. The movie compares improper handling of dog food in a manufacturing plant that causes the death of a family pet with improper handling of human food in a manufacturing plant that causes a child to become ill. Both cases illustrate how handling errors in food production can produce devastating outcomes. (The Quaker Oats Company-1993.) (Rev. 1998)

F2310 **Safe Food: You Can Make a Difference**—(25 minute videotape). A training video for food-service workers which covers the fundamentals of food safety. An explanation of proper food temperature, food storage, cross-contamination control, cleaning and sanitizing, and handwashing as methods of foodborne illness control is provided. The video provides an orientation to food safety for professional foodhandlers. (Tacoma-Pierce County Health Department-1990). (Rev. 1998)

F2320 **Safe Handwashing**—(15 minute videotape). Twenty-five percent of all foodborne illnesses are traced to improper handwashing. The problem is not just that handwashing is not done, the problem is that it's not done properly. This training video demonstrates the "double wash" technique developed by Dr. O. Peter Snyder of the Hospitality Institute for Technology and Management. Dr. Snyder demonstrates the procedure while reinforcing the microbiological reasons for keeping hands clean. (Hospitality Institute for Technology and Management-1991) (Rev. 1998)

F2330 **Sanitation for Seafood Processing Personnel**—(20 minute videotape). A training video suited for professional foodhandlers working in any type of food manufacturing plant. The film highlights Good Manufacturing Practices and their role in assuring food safety. The professional foodhandler is introduced to a variety of sanitation topics including: (1) food-handlers as a source of food contamination, (2) personal hygiene as a means of preventing food contamination, (3) approved food storage techniques including safe storage temperatures, (4) sources of cross-contamination, (5) contamination of food by insects and rodents, (6) garbage handling and pest control, and (7) design and location of equipment and physical facilities to facilitate cleaning. (Rev. 1998)

F2340 **Sanitizing for Safety**—(17 minute videotape). Provides an introduction to basic food safety for professional foodhandlers. A training pamphlet and quiz accompany the tape. Although produced by a chemical supplier, the tape contains minimal commercialism and may be a valuable tool for training new employees in the food industry. (Clorox-1990) (Rev. 1998)

F2350 **SERVSAFE® Serving Safe Food**—(4-20 minute videotapes). This video series illustrates and reinforces important food safety practices in an informative and entertaining manner. The material is presented in an easy to understand format, making it simpler for employees to learn and remember this essential information. Each video includes a leader's guide that provides all the information managers need to direct a productive training session. (Educational Foundation of the National Restaurant Association-1993) (Rev. 1998)

F2360 **SERVSAFE® Serving Safe Food Second Edition**—(6-10 minute videotapes). The program still covers all the major areas of food safety training, but there is an added emphasis on training employees to follow HACCP procedures. The second edition program includes an Employee Guide, Leader's Guide and six instructional videos. (Educational Foundation of the National Restaurant Association-1993)

F2430 **Smart Sanitation: Principles & Practices for Effectively Cleaning Your Food Plant**—(20 minute videotape) A practical training tool for new sanitation employees or as a refresher for veterans. Employees will understand the food safety impact of their day-to-day cleaning and sanitation activities and recognize the importance of their role in your company's food safety program. (Silliker Laboratories Group-1996)

F2370 **Supermarket Sanitation Program-"Cleaning & Sanitizing"**—(13 minute videotape). Contains a full range of cleaning and sanitizing information with minimal emphasis on product. Designed as a basic training program for supermarket managers and employees. (1989) (Rev. 1998)

F2380 **Supermarket Sanitation Program-"Food Safety"**—(11 minute videotape). Contains a full range of basic sanitation information with minimal emphasis on product. Filmed in a supermarket, the video is designed as a basic program for manager training and a program to be used by managers to train employees. (1989) (Rev. 1998)

F2390 **Take Aim at Sanitation**–(8 minute videotape). This video features tips on food safety and proper disposal of single service items. Also presented is an emphasis on food contact surfaces as well as the manufacture, storage and proper handling of these items. (Foodservice and Packaging Institute, Inc.-1995). (Available in Spanish)

F2410 **Wide World of Food-Service Brushes**—(18 minute videotape). Discusses the importance of cleaning and sanitizing as a means to prevent and control foodborne illness. Special emphasis is given to proper cleaning and sanitizing procedures and the importance of having properly designed and constructed equipment (brushes) for food preparation and equipment cleaning operations. (1989) (Rev. 1998)

F2420 **Your Health in Our Hands–Our Health in Yours**–(8 minute videotape). For professional foodhandlers, the tape covers the do's and don'ts of foodhandling as they relate to personal hygiene, temperature control, safe storage and proper sanitation. (Jupiter Video Production-1993). (Rev. 1998)

OTHER

M4010 **Diet, Nutrition & Cancer**—(20 minute videotape). Investigates the relationship between a person's diet and the risk of developing cancer. The film describes the cancer development process and identifies various types of food believed to promote and/or inhibit cancer. The film also provides recommended dietary guidelines to prevent or greatly reduce the risk of certain types of cancer.

M4020 **Eating Defensively: Food Safety Advice for Persons with Aids**–(15 minute videotape). While HIV infection and AIDS are not acquired by eating foods or drinking liquids, persons infected with the AIDS virus need to be concerned about what they eat. Foods can transmit bacteria and viruses capable of causing life-threatening illness to persons infected with AIDS. This video provides information for persons with AIDS on what foods to avoid and how to better handle and prepare foods. (FDA/CDC-1989)

M4030 **Ice: The Forgotten Food**–(14 minute videotape). This training video describes how ice is made and where the critical control points are in its manufacture, both in ice plants and in on-premises locations (convenience stores, etc.); it documents the potential for illness from contaminated ice and calls on government to enforce good manufacturing practices, especially in on-premises operations where sanitation deficiencies are common. (Packaged Ice Association-1993)

M4040 **Legal Aspects of the Tampering Case**—(25 minute videotape). This was presented by Mr. James T. O'Reilly, University of Cincinnati School of Law at the fall 1986 Central States Association of Food and Drug Officials Conference. He emphasizes three factors from his police and legal experience-know your case, nail your case on the perpetrator, and spread the word. He outlines specifics under each factor. This should be of the greatest interest to regulatory sanitarians, in federal, state and local agencies. (1987)

M4050 **Personal Hygiene & Sanitation for Food Processing Employees**–(15 minute videotape). Illustrates and describes the importance of good personal hygiene and sanitary practices for people working in a food processing plant. (Iowa State-1993)

M4060 **Psychiatric Aspects of Product Tampering**—(25 minute videotape). This was presented by Emanuel Tanay, M.D. from Detroit, at the fall 1986 conference of CSAFDA. He reviewed a few cases and then indicated that abnormal behavior is like a contagious disease. Media stories lead to up to 1,000 similar alleged cases, nearly all of which are false. Tamper-proof packaging and recalls are essential. Tampering and poisoning are characterized by variable motivation, fraud and greed. Law enforcement agencies have the final responsibilities. Tamper proof containers are not the ultimate answer. (1987)

M4070 **Tampering: The Issue Examined**–(37 minute videotape). Developed by Culbro Machine Systems, this videotape is well done. It is directed to food processors and not regulatory sanitarians or consumers. A number of industry and regulatory agency management explain why food and drug containers should be made tamper evident. (Culbro-1987)

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❒ D1030 Cold Hard Facts
❒ D1040 Ether Extraction Method for Determination of Raw Milk
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❒ D1130 Pasteurizer - Design and Regulation
❒ D1140 Pasteurizer - Operation
❒ D1150 Processing Fluid Milk

ENVIRONMENTAL

❒ E3010 The ABCs of Clean – A Handwashing & Cleanliness Program for Early Childhood Programs
❒ E3020 Acceptable Risks?
❒ E3030 Air Pollution: Indoor
❒ E3040 Asbestos Awareness
❒ E3055 Effective Handwashing–Preventing Cross-Contamination in the Food Service Industry
❒ E3060 EPA Test Methods for Freshwater Effluent Toxicity Tests (Using Ceriodaphnia)
❒ E3070 EPA Test Methods for Freshwater Effluent Toxicity Tests (Using Fathead Minnow Larva)
❒ E3080 Fit to Drink
❒ E3110 Garbage: The Movie
❒ E3120 Global Warming: Hot Times Ahead
❒ E3130 Kentucky Public Swimming Pool & Bathing Facilities
❒ E3135 Plastic Recycling Today: A Growing Resource
❒ E3140 Putting Aside Pesticides
❒ E3150 Radon
❒ E3160 RCRA – Hazardous Waste
❒ E3170 The New Superfund: What It is & How It Works–(1) Changes in the Remedial Process: Clean-up Standards & State Involvement Requirements
❒ E3180 The New Superfund: What It is & How It Works–(2) Changes in the Removal Process: Removal & Additional Program Requirements
❒ E3190 The New Superfund: What It is & How It Works – (3) Enforcement and Federal Facilities
❒ E3210 The New Superfund: What It is & How It Works – (4) Emergency Preparedness & Community Right-to-Know
❒ E3220 The New Superfund: What It is & How It Works – (5) Underground Storage Tank Trust Fund & Response Program
❒ E3230 The New Superfund: What It is & How It Works – (6) Research & Development/Closing Remarks
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❒ F2037 Cooking and Cooling Meat and Poultry Products
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❒ F2045 Food Microbiological Control
❒ F2050 Food Safe - Food Smart - HACCP & Its Application to the Food Industry (Part 1&2)
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❒ F2110 Food Safety is No Mystery
❒ F2130 Food Safety: You Make the Difference
❒ F2135 Get with a Safe Food Attitude
❒ F2140 GMP Basics: Employee Hygiene Practices
❒ F2143 GMP Basics: Guidelines for Maintenance Personnel
❒ F2148 GMP - GSP Employee
❒ F2150 GMP: Personal Hygiene and Practices in Food Manufacturing
❒ F2147 GMP Basics: Process Control Practices
❒ F2160 GMP: Sources & Control of Contamination during Processing
❒ F2165 HACCP and Its Application to the Food Industry
❒ F2180 HACCP: Safe Food Handling Techniques
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❒ F2230E Purely Coincidental - English
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❒ F2320 Safe Handwashing
❒ F2330 Sanitation for Seafood Processing Personnel
❒ F2340 Sanitizing for Safety
❒ F2350 SERVSAFE® Serving Safe Food (4 Videos)
❒ F2360 SERVSAFE® Serving Safe Food Second Edition (6 Videos)
❒ F2430 Smart Sanitation: Principles & Practices for Effectively Cleaning Your Food Plant
❒ F2370 Supermarket Sanitation Program - "Cleaning & Sanitizing"
❒ F2380 Supermarket Sanitation Program - "Food Safety"
❒ F2390 Take Aim at Sanitation
❒ F2410 Wide World of Food-Service Brushes
❒ F2420 Your Health in Our Hands - Our Health in Yours

OTHER

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3-A® Sanitary Standards for Crossflow Membrane Modules, Number 45-01

Formulated by
International Association of Food Industry Suppliers (IAFIS)
International Association of Milk, Food and Environmental Sanitarians (IAMFES)
United States Public Health Service (USPHS)
The Dairy Industry Committee (DIC)

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

A **SCOPE**

A1 These standards cover the sanitary aspects of crossflow membrane modules for use with ultrafiltration, diafiltration, microfiltration and reverse osmosis systems for processing milk and milk products.

A2 In order to conform with these 3-A Sanitary Standards, membrane modules shall comply with the following design, material, and fabrication criteria.[1]

B **DEFINITIONS**

B1 **General**

B1.1 *Product*: Shall mean milk, milk products or their fractions which are fractionated, concentrated or otherwise processed in this equipment and are to be used for human food. Either or both permeate or retentate are products.

B1.2 *Feed*: Shall mean that portion of the product that is about to enter the element. It may include recycled permeate, concentrate or retentate.

B1.3 *Permeate*: Shall mean that portion of the product which has passed through the membrane during processing.

B1.4 *Retentate*: Shall mean that portion of the product which does not pass through the membrane during processing.

B1.5 *Concentrate*: Shall mean that portion of the retentate that has left the system for disposition as final product or for recycling.

B1.6 *Membrane*: Shall mean a selectively permeable barrier which can separate a multicomponent stream into fractions. This membrane may be polymeric, organic, inorganic or mineral.

B1.6.1 *Asymmetric Membrane*: Shall mean a membrane with an integral graded structure having a relatively consolidated surface skin underlain by a progressively more open spongy base.

B1.6.2 *Composite Membrane*: Shall mean a membrane which consists of several superposed chemically or physically different layers. (Usually a composite membrane has a thin active surface membrane of one material affixed to an asymmetric supporting membrane of another material.)

B1.7 *Membrane Support Material*: Shall mean porous material used for supporting the membrane.

B1.8 *Feed Channel Spacer*: Shall mean the open mesh screen used to maintain spacing between the membranes in elements and to define the channels through which retentate flows.

B1.9 *Permeate Carrier*: Shall mean the porous material used for conducting permeate away from the membrane to a collection point in the membrane element. The permeate carrier may be identical with the membrane support material.

B1.10 *Bypass Flow Restrictor*: Shall mean a device to direct feed material through the membrane elements' retentate flow channels while allowing a controlled amount to bypass these channels.

B1.11 *Module*: Shall mean that part of the membrane equipment that contains the membrane elements, element connectors, and external shrouds or housing. The module interfaces with the system pipelines carrying products to and from it.

B1.11.1 *Boundaries*: The boundaries of the membrane module are defined as the connections between:

a. The feed manifold and the feed line(s) to the module.
b. The retentate collection manifold and the retentate line(s) from the membrane module.
c. The permeate collection manifold and the permeate line(s) from the membrane module.

B1.12 *Membrane Element*: Shall mean that part of the module which contains the membrane and is replaceable. (The element may be identical with the module and may contain the membrane support material and the permeate carrier.) There are six configurations of elements. These are:

a. Tubular
b. Spiral wound
c. Plate and frame
d. Parallel leaf
e. Hollow fiber
f. Monolithic ceramic

In these different configurations, the membrane support material may be part of the replaceable element or part of the module structure.

B1.13 *External Shroud*: Shall mean the impermeable shell which forms the exterior structure of the module. It may provide mechanical strength to resist internal operating pressure and may serve as a permeate collection vessel except for spiral modules where it serves as a feed conduit.

B1.14 *Membrane Element Seal(s)*: Shall mean that part of the module which is designed to prevent flow between the feed and retentate channel spaces and the permeate space.

B1.15 *Feed Channel Space*: Shall mean that flow channel within the module where product is introduced to the membrane element(s) for the purpose of concentration, fractionation or otherwise processed.

B1.16 *Retentate Channel Space*: Shall mean that flow channel within the module where products that do not flow through the membrane are discharged from the membrane element(s).

B1.17 *Permeate Channel Space*: Shall mean that part of the module where the permeate is collected as it flows from the membrane element(s).

B1.18 *Permeate Connector*: Shall mean that part of the module used for making a sanitary connection to the permeate collection line or manifold at the boundary of the module.

B1.19 *Feed Connector*: Shall mean that part of the module used for making a sanitary connection to the feed line(s) or manifold at the boundary of the module.

B1.20 *Retentate Connector*: Shall mean that part of the module used for making a sanitary connection to the retentate line(s) or manifold at the boundary of the module.

B1.21 *Cross Flow*: Shall mean the retentate flows in a direction parallel to the membrane surface.

B1.22 *Through Flow*: Shall mean entrance of fluid at one end of a passage and its removal at the opposite end so that the flowing fluid passes without dead areas through the intervening space.

B1.23 *System*: Shall mean all mechanical hardware, pumps, pipelines, instrumentation and the membrane module(s).

B1.24 *Membrane Process Equipment*: Shall mean equipment in which products are fractionated, concentrated or otherwise processed by a membrane.

B1.25 *Manifold*: Shall mean that part of the system to which connections are made to bring product, permeate, or cleaning solution to and from the module.

B2 **SURFACES**

B2.1 *Product Contact Surface*: Shall mean all surfaces that are exposed to the product or any of its fractions (whether feed, concentrate, retentate, or permeate) and surfaces from which liquid may drain, drop, or be drawn into the products.

B2.2 *Nonproduct Contact Surface*: Shall mean all other exposed surfaces.

B3 **CLEANING**

B3.1 *Mechanical Cleaning or Mechanically Cleaned*: Shall denote cleaning, solely by circulation and/or flowing chemical and/or enzyme cleaning solutions and water rinses onto, over, and/or through the surfaces to be cleaned, by mechanical means.

B4 **TUBULAR MODULE**

B4.1 *Tubular Module*: Shall mean a module whose membrane elements carry retentate in individual, separated, rigid tubes of about 0.2 inch or larger inside diameter. These tubes may be single or multiple elements within an external shroud. (See Appendix F1.)

B4.2 *"U" Bend*: Shall mean that device attached to the end of a tubular element used to reverse the direction of retentate flow and direct it into another tubular element.

B4.3 *Ferrule*: Shall mean the fitting(s) attached to the end of a tubular element used for making sanitary connection to a "U" Bend or manifold.

B4.4 *Membrane Array*: Shall mean a parallel array of one or more hollow single tubular or multi-channel tubular membrane elements contained within the module's external shroud.

B4.5 *Header*: Shall mean the device at the end of a multitubular element that holds the tubes in fixed array and into which they are sealed. Headers may be potted or cast in place, molded, or machined.

B4.6 *Grommet*: Shall mean the elastomeric part used to seal tubes into headers. It acts as a membrane element seal.

B4.7 *Expander*: Shall mean that device which when inserted into the end of the tube expands it against the grommet and the grommet against the tube sheet to effect a seal.

B4.8 *Membrane Element Support Tube*: Shall mean that part of the module which closely supports the membrane element. This tube may be made of a porous composite or stainless steel.

B4.9 *Module End Plate*: Shall mean part of a multi-tube into which the membrane element support tubes are fitted. (Single tube elements may have an individual connector like a ferrule.)

B4.10 *Header Cap*: Shall mean that devise fitted to the end of a module, used to direct the flow-path of the feed and retentate through the tubular membrane elements in the module. The header cap may:

a. Direct the flow-path through all the tubularelements in parallel; or

b. Connect all the tubular elements in series by means of internally-molded U-bends; or

c. Separate the flow into two or more parallel paths each consisting of two or more tubular elements connected in series by means of internally-molded U-bends.

B4.11 *Supported Metallic Oxide Membrane Module*: Shall mean a tubular module whose elements are formed from a rigid porous support on which has been deposited a metallic oxide coating to form the membrane. (See Appendix F1.3.)

B4.11.1 *End Tubular Plate*: Shall mean the drilled plate which holds the membrane elements in position and provides the surface to support and seal the membrane element gasket and counter plate.

B4.11.2 *Counter Plate*: Shall mean the bored plate used to compress the membrane element gasket and to conduct retentate flows to the inlet of membrane elements.

B4.11.3 *Inner Spacer*: Shall mean the device used to hold the membrane elements in the correct position in the interior of the module.

B5 **Spiral Wound Module**

B5.1 *Spiral Wound Module*: Shall mean a module whose element is formed of leaves of membrane, membrane support, feed channel spacer, and permeate carrier wound in spiral fashion around a central permeate collection tube. (See Appendix F2.)

B5.2 *Anti-Telescope Device (ATD)*: Shall mean a support for spiral type elements to prevent their layers from sliding past each other when the element is in operation.

B5.3 *Element Connector or Interconnector*: Shall mean the device used within modules to connect together membrane elements. In some embodiments, the element connector may be incorporated into the anti-telescoping device.

B5.4 *Permeate Collection Tube*: Shall mean a perforated tube usually centrally located in a spiral membrane element into which permeate is conducted from the permeate carrier. The permeate collection tube conducts permeate out of the element.

B5.5 *Connector/Interconnector Seals*: Shall mean the device for forming a seal between the module connector and the permeate collection tube.

B5.6 *End Cap*: Shall mean the cover at the end of the external shroud which connects with the permeate collection tube.

B5.7 *Glue Seams*: Shall mean the areas at each edge of a leaf to which adhesive is applied to bind the materials together and form a seal. (Note that each leaf generally has two end glue seams and one axial glue seam so named because of their relative locations in the finished element.)

B5.8 *Leaf*: Shall mean the sandwich of membrane, membrane support material, permeate carrier and feed channel spacer that are multiply laid up and wound around the permeate collection tube to form a spiral element.

B5.9 *Fold Line:* Shall mean the location adjacent to the permeate tube at which the membrane is bent 180° back upon itself for insertion into the spiral wound membrane element.

B5.10 *Crease Protection Materials:* Shall mean materials applied to the fold area, on either side of the membrane to prevent leakage of feed into the permeate in the event of damage to the membrane.

B5.11 *Stitching Material:* Shall mean thread used to sew and attach adjacent leaves of the permeate carrier material to maintain leaf spacing during fabrication.

B6 **Plate and Frame Module**

B6.1 *Plate and Frame Module*: Shall mean a module formed of multiple sandwiches of flat membrane elements held together by an external supporting frame. (See Appendix F3.)

B6.2 *Module of Plate and Frame Design*: Shall mean that part of the membrane processing system that contains the membrane elements of plate and frame design. The module consists of:

a. Membrane elements.
b. Supporting frame.
c. Permeate collection manifold.

The module interfaces with the system pipelines carrying product to and from it.

B6.3 *Membrane Support Plate*: Shall mean that part of the membrane element which provides mechanical support for the membrane. The membrane support plate receives the permeate from the membranes and delivers it to the permeate collection manifold.

B6.4 *Lock Rings*: Shall mean that part of the membrane element which can hold the membrane support plate and the two attached membranes together and form a barrier between the permeate and the retentate.

B6.5 *Spacer Plate*: Shall mean that part of the membrane element which provides the necessary space to create the circulation channels across the membrane. The spacer plate separates two adjacent membrane support plates with membranes and lock rings.

B6.6 *Section Plate*: Shall mean that part of the membrane element that makes it possible to divide the module into sections.

B6.7 *Supporting Frames*: Shall mean that part of the module which internally or externally holds all the membrane elements within the module pressed together and provides the necessary support. The supporting frame consists of:

a. End flanges.
b. Connecting bolt(s).
c. Supporting legs.

B6.7.1 *End Flanges*: Shall mean those parts of the supporting frame which hold together all the membrane elements within the module and provide the inlet connection from the feed line(s) to the module and the outlet connection from the module to the retentate line(s). The end flanges may include a flow distributing ring.

B6.7.2 *Connecting Bolt(s)*: Shall mean that part(s) of the supporting frame which connects the end flanges and holds together the stack of membrane elements.

B6.7.3 *Supporting Legs*: Shall mean that part of the supporting frame which provides means for support of the whole module.

B6.8 *Permeate Collection Manifold*: Shall mean that part of the membrane module that receives the permeate from the membrane element. The manifold can be an integral part of the membrane element or be connected to this by flexible hose.

B7 **Parallel Leaf Module**

B7.1 *Parallel Leaf Module*: Shall mean a module formed of multiple membrane elements whose membrane has been permanently bonded to a rigid support plate. (See Appendix F.4.)

B7.2 *Membrane Cartridge*: Shall mean a multiple of membrane elements joined to form a unit to be inserted into a membrane housing.

B7.3 *Permeate Fitting*: Shall mean a device for communicating permeate from the membrane cartridge to the permeate tubing. It may hold and seal the membrane cartridge in situ.

B7.4 *Membrane Element Retaining Clamp*: Shall mean a device for holding together a multiple of membrane elements (membrane element stack). The retaining clamp consists of two rigid nonporous plates, one on each side of the membrane element stack, and a tie rod that holds the two rigid plates together.

B8 **Hollow Fiber Module**

B8.1 *Hollow Fiber Module*: Shall mean a module whose membrane elements are formed of a multiplicity of flexible tubules generally less than 0.2 inches (5.1 mm) in inside diameter and potted or otherwise bound together into a common header. (See Appendix, F5.)

B8.2 A module of hollow fiber design shall consist of the following components:

a. Membrane cartridge.
b. Process manifold adapter assembly.
c. Permeate adapter assembly.

B8.3 *Membrane Cartridge*: Shall mean a parallel array of hollow fiber membrane elements which are housed in a plastic or metallic cartridge assembly and fixed at both ends via an adhesive tubesheet. The hollow fiber membrane element is a self supporting structure. Therefore, in this configuration, the membrane element and support are an integral part of the membrane cartridge.

B8.4 *Process Manifold Adapter Assembly*: Shall mean that part of the membrane module that connects the membrane cartridge to the system pipelines that carry product to and from the cartridge. This assembly consists of a manifold adapter, V-band clamp and a gasket.

B8.5 *Permeate Adapter Assembly*: Shall mean that part of the membrane module that connects the permeate outlets of each membrane cartridge to the permeate collection manifold. This assembly consists of a permeate adapter, V-band clamp and gasket.

B8.6 *Membrane Sheath*: Shall mean that part of the membrane cartridge which provides mechanical support to the hollow fiber membrane elements.

B8.7 *Tube Sheet*: Shall mean the thermoset adhesive compound that is used to seal the hollow fiber membrane elements into the membrane housing.

B9 **Monolithic Ceramic Modules**

B9.1 *Monolithic Ceramic Module*: Shall mean a module that contains membrane elements wherein the membrane and the support are ceramic bonded structures which are in turn joined by ceramic bonds such that the joined membrane and support are monolithic in nature. (See Appendix F6.)

B9.2 *Ceramic Bond*: Shall mean the joining of ceramic materials by heat to produce fusion or sintering between particles.

B9.3 *Ceramic Membrane Support*: Shall mean a ceramic porous base structure used to support a thinner and finer more uniformly graded porous structure. A membrane element may contain one or more supports all joined by ceramic bonds.

B9.4 *Membrane Element Retainer*: Shall mean that part of the module which is designed to retain in place the membrane element seals and membrane element(s).

B9.5 *Membrane Element Fixed Retainer*: Shall mean a retainer which is a part of the shroud.

B9.6 *Membrane Element Removable Retainer*: Shall mean a retainer which is secured to the external shroud by mechanical means and may be removed for membrane element seal or membrane element cleaning or replacement.

B9.7 *Membrane Element Array*: Shall mean a parallel array of one or more single tubes or multichannel membrane elements contained within the module shroud.

C **MATERIALS**

C1 Membrane product contact surfaces, membrane support material, permeate carrier material, stitching and crease protection materials, shall be constructed of materials meeting one of the following:

a. Title 21, Part 177 of the Code of Federal Regulations, or
b. Generally recognized as safe (GRAS Title 21, Part 182 of the Code of Federal Regulations) or affirmed (GRAS Title 21 Part 186 of the Code of Federal Reguations), or
c. Otherwise be approved by the Food and Drug Administration for food contact.

Users may rely on vendor certification that proprietary materials meet these requirements.

C2 All product contact surfaces except those listed in C1 shall be:

C2.1 Plastic or plastic-like materials complying with applicable provisions of 3-A Sanitary Standards for Multiple-Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment, Number 20-, or

C2.2 Stainless steel of the American Iron and Steel Institute (AISI) 300 series[2] or the corresponding Alloy Cast Institute (ACI)[3] types. (see Appendix G) or types which under conditions of intended use are at least as corrosion-resistant as stainless steel of the foregoing types and are non-toxic and non-absorbent, except that;

C2.2.1 Rubber and rubber-like materials may be used for gaskets, seals, flexible product connectors, and O-rings.

C2.2.2 Rubber and rubber-like materials when used for the above specified applications shall comply with the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Rubber and Rubber-Like Materials Used as Product Contact Surfaces in Dairy Equipment, Number 18-.

C2.2.3 Bonded rubber and rubber-like materials AMD bonded plastic materials having product contact surfaces shall be of such composition as to retain their surface and conformational characteristics when exposed to conditions encountered in the environment of intended use in cleaning and bactericidal treatment.

C2.2.4 Fiberglass reinforced composites may be used where required for strength such as for membrane element support tubes.

C2.2.5 Adhesive and potting materials in product contact surfaces including edge contact shall meet the requirements of Title 21, Part 175.105 or part 175.300 of the Code of Federal Regulations and be inert under conditions of operation, cleaning and sanitizing.

C2.2.6 Composite methods of construction may be used to produce elements with ceramic materials for supports different than the materials used for the membrane. Such composites shall retain the ceramic bond properties between multiple supporting layers.

C2.2.6.1 Ceramic materials selected shall be such that the membrane ceramic bonds attach the membrane to the support with sufficient mechanical integrity that it does not peel, chip or spall under processing or cleaning and sanitizing conditions.

C3 All materials used shall be inert, nontoxic, insoluble in the product and in cleaning and sanitizing solutions. They shall be resistant to scratching, scoring, and distortion when exposed to the conditions of intended use and of cleaning and sanitizing.

C4 Nonproduct surfaces shall be of corrosion-resistant material or material that is rendered corrosion resistant. If coated, the coating used shall adhere. Nonproduct surfaces shall be relatively nonabsorbent, durable, and cleanable. Parts removable for cleaning having both product and nonproduct contact surfaces shall not be painted.

D **FABRICATION**

D1 **General**

D1.1 The module shall be constructed such that the element can be mechanically cleaned on both retentate and permeate sides.

D1.2 Membrane elements designed and constructed to fit into a shroud shall be without dead spaces so that they and it can be mechanically cleaned by a through flow of cleaning and sanitizing solutions.

D1.3 The design and fabrication of the membrane element seals and retainers shall take into consideration the combined effects of differential thermal expansions, between the shroud, if any, and the elements, hydraulic shock and thermal shock such that the membrane elements are free of excessive compressive or tensile forces. The membrane element seals or supports, as the case may be, shall be designed in such a manner as to firmly support the membrane elements but allow for elastic axial and lateral movements to prevent undue stress and strains which could lead to failure of the membrane.

D1.4 The membrane shall be firmly attached to its support material or have sufficient mechanical integrity that it does not peel, spall or chip.

D1.5 Grommets or seals against the membrane surface must be made against impermeable support materials or alternatively against porous materials that can be mechanically cleaned or demonstrated to be effectively sealed.

D1.6 **Surfaces**

D1.6.1 All product contact surfaces shall have a finish at least as smooth as a No. 4 ground finish on stainless steel sheets and be free of imperfections such as pits, folds, and crevices in the final fabricated form except those in the membrane element. (See Appendix H.)

D1.6.2 Permanent metallic joints in product contact surfaces shall be continuously welded, except that tubes may be expanded and rolled into tube sheets. Welded areas on product contact surfaces shall be at least as smooth as a No. 4 ground finish on stainless steel sheets free of imperfections such as pits, folds, and crevices. When tubes are expanded and rolled into tube sheets, the resulting joint shall be completely rigid and without pockets or crevices. Alternatively metallic joints, if used, shall be in accord with the 3-A Accepted Practices for Permanently Installed Product and Solution Pipelines and Cleaning Systems Used in Milk and Milk Product Processing Plants, Number 605-.

D1.6.3 Bonded rubber and rubber-like materials and bonded plastic materials having product contact surfaces shall be bonded in a manner that the bond is continuous and mechanically sound, so that when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment, the rubber and rubber-like material or plastic material does not separate from the base material to which it is bonded.

D1.6.4 Appurtenances having product contact surfaces shall be easily removable for cleaning and inspection, or shall be mechanically cleanable.

D1.6.5 Membrane modules shall be designed for chemical and mechanical cleaning and sanitizing of all product contact surfaces.

D1.6.6 There shall be no exposed threads on product contact surfaces.

D1.6.7 Nonproduct contact surfaces shall be smooth, free of pockets and crevices and be readily cleanable and those to be coated shall be properly prepared for coating.

D1.6.8 When used, fiberglass shall be completely encapsulated with no exposed fibers with a polymeric coating meeting the requirements of Title 21, Section 175 or 177 of the Code of Federal Regulations.

D1.7 **Connections**

D1.7.1 Product connections to manifolds shall meet 3-A Sanitary Standards for Sanitary Fittings for Milk and Milk Products, Number 63- except that these connections shall be made in a sanitary manner with rigid and/or flexible connectors provided the materials comply with the applicable provisions of 3-A Sanitary Standards for Multiple-Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment, Number 20-.

D1.7.2 Flexible permeate tubes are permitted and shall have connections that are crevice free. Internal diameter may be selected to suit mechanical requirements.

D1.7.3 Hose clamps shall be easily disassembled and assembled.

D1.8 **Gaskets and Seals**

D1.8.1 Gaskets having a product contact surface shall be removable or permanently bonded to the surface. Any gasket groove or gasket retaining groove except in the bonded area shall be no deeper than its width and shall not exceed 1/4 inch (6.35 mm) in depth or be less than 1/4 inch (6.35 mm) wide except those for standard O-Rings smaller than 1/4 inch (6.35 mm).

D1.8.2 Grooves in gaskets shall be no deeper than their width and the minimum radius of any internal angle shall not be less than 1/8 inch (3.18 mm) unless the gasket is readily removable and reversible for cleaning.

D1.8.3 Gasket grooves or gasket retaining grooves in product contact surfaces for removable gaskets shall not exceed 1/4 inch (6.35 mm) in depth and, except those for standard O-rings smaller than 1/4 inch (6.35 mm), shall be at least 1/4 inch (6.35 mm) wide.

D1.8.4 Element seals that are potted, poured, or otherwise cast in place shall have joints that are fully filled such that there are no voids pits or cavities.

D1.8.5 Element seals of the grommet type shall be one piece construction and shall firmly fit the mating surfaces such that there are no crevices or voids.

D1.9 **Radii**

D1.9.1 Internal angles on product contact surfaces shall have minimum radii of 1/16 inch (1.59 mm), except:

D1.9.1.1 Gasket recesses and grooves in which all sharp corners shall be avoided.

D1.9.1.2 The minimum radii in gasket grooves or gasket retaining grooves other than those for bonded gaskets or for standard 1/4 inch (6.35 mm) and smaller O-rings shall be not less than 1/8 inch (3.18 mm).

D1.9.1.3 The minimum radii in grooves for standard 1/4 inch (6.35 mm) O-rings shall be not less than 3/32 inch (2.38 mm) and for standard 1/8 inch (3.18 mm) O-rings shall be not less than 1/32 inch (0.794 mm). In either case the internal product contact surface must be readily available for cleaning and inspection.

D1.9.1.4 For essential functional reasons, smaller internal angles or radii may be used provided the product contact surfaces are demonstrated to be mechanically cleanable.

D2 **Tubular Modules**

D2.1 The element shall fit into its shroud without dead spaces so that it can be completely mechanically cleaned by through flow of cleaning solutions or placed in the shroud so that the exterior can be flooded or sprayed with cleaning solution to achieve effective cleaning.

D2.2 Ferrules that are potted, swaged or otherwise attached to tubes must have joints fully filled so that there are no voids.

D3 **Spiral Wound Modules**

D3.1 Glue seams in spiral elements shall be free of indentations or protrusions that may interfere with cleaning and shall be of sufficiently uniform width not to impede permeate flow.

D3.2 The cut surfaces of the element shall be completely within the glue area.

D3.3 Elements shall be tightly wound and have interior flow channels that are uniform in height.

D3.4 Elements shall be equipped with a bypassing flow restrictor to allow a portion of the feed stream to flow through the annulus between the element and its external shroud to eliminate an annular dead-end condition and to keep that area clean.

D3.5 The membrane support material and the permeate carrier material are porous. Visual inspection of an element from time to time after cleaning shall be necessary to confirm that cleaning and sanitation are effective.

D3.5.1 Permeate carrier material may be fixed in position with porous materials by stitching, intermittent ultrasonic attachment, or other methods, provided that the areas are open to the flow and penetration of cleaning solutions.

D3.6 Shrouds for spiral elements shall be fabricated of stainless steel or plastic. All joints shall be free from flaws and voids and flush with adjoining surfaces.

D3.7 The anti-telescope device and module inter-connectors shall be designed in such a way that element surfaces can be mechanically cleaned and no dead-end areas are created.

D3.8 Inter-connector seals shall be tight with no open crevices and shall be made against impervious surfaces.

D3.9 Crease protection materials complying with Sections C.1 or C.2.2.5 such as tape may be present at the fold lines.

D3.10 Feed channel spacer material shall be located as close as practical to the fold line to promote flow through the fold line area.

D4 **Plate and Frame Modules**

D4.1 Membrane surface shall be smooth, flat and devoid of wrinkles.

D4.2 The membrane, support plates, and spacer plates shall be tightly stacked and have a uniform flow in the retentate flow channels.

D4.3 Elastomeric seals, locking rings and gaskets shall be a sanitary design with no open crevices and made against impervious surfaces or demonstrated to be effectively sealed.

D4.4 End-flange(s), spacer, section, and support plates, permeate manifolds, and lock rings shall be fabricated of stainless steel or plastic.

D4.5 The membrane support plates may be porous. Visual inspection of the plates from time to time, after cleaning, shall be necessary to ensure cleaning and sanitation procedures are effective.

D4.6 The permeate outlet shall be positioned in such a way that when assembled, air is not entrapped in the plate.

D5 **Parallel Leaf**

D5.1 The membrane (of the membrane element) shall be firmly attached to the membrane support plate with even and continuous leak-proof bonds of sufficient mechanical integrity to remain free of voids, peel backs or delaminations. The transition from protruding support plate surface to membrane surface shall be smooth.

D5.2 Membrane surface shall be smooth, flat and devoid of wrinkles.

D5.3 Membrane cartridges shall be tightly stacked and have uniform retentate flow channels.

D5.4 When bypassing flow restrictors are employed, they shall allow a portion of the feed stream to flow through the annulus between the membrane cartridge and the membrane housing to keep that area clean.

D5.5 Elastomeric seals and gaskets should be of sanitary design with no open crevices, and made against impervious surfaces, or alternatively, against porous materials that can be mechanically cleaned or demonstrated to be effectively sealed.

D5.6 Housings and membrane element retaining clamps shall be fabricated of stainless steel or plastic.

D5.7 The membrane support material and the membrane element permeate carrier material are porous. Visual inspection of an element from time to time, after cleaning, shall be necessary to assure cleaning and sanitation procedures are effective.

D6 **Hollow Fiber Modules**

D6.1 The manifold adapter assembly shall utilize sanitary type gasket designs and stainless steel clamps at both the membrane cartridge and system feedline interface connections.

D6.2 The permeate adapter assembly shall utilize sanitary type gasket designs and stainless steel clamps at both the cartridge permeate outlet and permeate collection manifold interface connections.

D6.3 The surface of the epoxy or thermoset adhesive tube sheet shall be smooth and free of pits, voids or crevices.

D6.4 Membrane cartridge housings shall be fabricated of plastic or stainless steel.

D7 **Monolithic Ceramic Modules**

D7.1 Ceramic membrane elements shall be a monolithic construction incorporating both the support and the membrane into a one-piece element resistant to delamination, peeling, chipping or spalling of the membrane.

E **INSTALLATION, OPERATION AND CLEANING**

E1 Membrane modules shall be installed, operated and mechanically cleaned in a membrane processing system meeting the requirements of the 3-A Accepted Practice for the Sanitary Construction, Installation, and Cleaning of Membrane Processing Systems for Milk and Milk Products, 610-.

APPENDIX

F **MODULE DESCRIPTION**

F1 **Tubular Modules**

Tubular modules may be made of single tubes, multiple tubes and/or arrays of tubes. In general, tubular modules are cylindrical with the tubes sealed at each end into an external shroud. The feed product usually flows inside the tubes with the external shroud acting as a permeate collection vessel. In some elements headers are used to join together multiple tubes in parallel as in a shell and tube heat exchange. U-bends are used to join modules together in series.

F1.1 **Large Diameter Tubes**

These tubes are usually one inch (25.4 mm) in diameter and approximately ten feet (305 cm) long. A stainless steel ferrule at each end of

the tube connects to a U-bend to join a number of tubes in series. These tubes are placed in a cabinet which contains inlet and outlet manifolds for the product to be processed. Permeate drips from the tubes and collects in the bottom of the cabinet which serves as an external shroud. Permeate is collected and pumped away for disposal or use. Cabinets are often equipped with spray nozzles to help clean and sanitize the exterior of tubes. Figure F1.1 illustrates a large diameter tube and cabinet. The tube itself is formed from a membrane placed on a porous composite membrane support material.

F1.2 **Small Diameter Tubes**

These tubes are usually about one-half inch in diameter and are formed together into elements of multiple tubes by gluing or potting the ends together. There are several configurations.

a. Exposed Outer Surface – This design is similar in concept to the one-inch tube. There is no closely fitted external shroud. The tubes are glued in stainless steel manifolds in cabinets. A composite material is used for membrane support. See Figure F1.2.

b. Closely Supported – In this configur-ation the membrane tubes are placed into closely fitting stainless steel support tubes which may in some cases also serve the function of external shroud and permeate collection vessel. Stainless steel headers are customarily used at each end to bring product to and from the tubes. In some configurations the headers also have internal flow channels that collect permeate from the annular space between the membrane tube and its supporting stainless steel tube. In others the supporting stainless tube is perforated so that permeate collects within a separate external shroud. See Figure F1.3.

c. Potted – Here a bundle of tubes are potted together and sealed into an external shroud that has inlet and outlet fittings for the product. The tubes are self supporting with the shroud serving as the permeate collection vessel. See Figure F1.5.

F1.3 **Supported Metallic Oxide**

F1.3.1 The supported metallic oxide module consists of a multitude of tubular membrane elements. Membrane elements are assembled in parallel bundle tubes in a pressure shroud. An end tubular plate at both ends of the shroud holds each membrane element. A membrane element gasket at each end of the module provide sealing of all ends of membrane elements and between retentate and permeate side. Counter plates are used to press gaskets and for conducting retentate flow to the membrane elements. One inner spacer holds membrane elements spaced. The shroud is equipped with connection as two retentate inlet or outlet and two permeate outlets.

F1.3.2 The fluid to be processed enters the module through the retentate inlet. It flows as cross flow through the tubular membrane element. Permeate is conducted away from the membranes by supports to permeate vessel, then to the outlet.

F1.3.3 Figure F1.6 shows assembly of membrane elements in the shroud and associated parts.

F2 **Spiral Wound Modules**

F2.1 Spiral wound elements have multiple leaves of alternating membrane, feed carrier and permeate carrier wound around perforated central permeate collection tube. Figure F2.1 is a schematic illustration of the assembly. The fluid being processed flows axially parallel to the permeate tube in between sheets of membrane held apart by the feed channel spacer. Permeate collects in the permeate carrier and flows in that carrier in a spiral fashion inwardly to the permeate collection tube.

F2.2 Spiral elements are usually connected together in groups of two or three at the permeate tube. These elements fit into an external shroud that contains all necessary inlet and outlet ports.

F2.3 An anti-telescoping device (ATD) helps each element to resist the flow forces during operation. These anti-telescope devices (ATDs) may also be connectors for the modules.

F2.4 Figure F2.2 shows how elements fit into the external shroud and its associated hardware. This assembly of elements, connectors, anti-telescope devices, shroud and associated hardware forms the membrane module.

F3 **Plate and Frame Modules**

F3.1 The plate and frame module consists of a multitude of membrane elements assembled (stacked) and held together by means of the supporting frame. (Figures F3.1.1, F3.1.2, F3.1.3, F3.1.4 and F3.1.5.)

F3.2 The geometry of the membrane support plate is such as to form retentate flow channels between the membranes. A variant is to have the retentate flow channels formed in a spacer plate inserted between the support plates with membranes.

F3.3 The sealing between the elements or to the end flanges can be made either with an elastomeric ring or with a seal lip formed at the perimeter of the support plate or spacer plate.

F3.4 The module can be divided into sections of membrane elements by means of sections plates (Figures F3.1.2 and F3.1.4).

F3.5 Each membrane support plate has a permeate outlet which is connected to the permeate manifold. The permeate manifold can be an integral part of the membrane element or be connected by flexible hoses. (Figure F3.1.1.)

F4 **Parallel Leaf Modules**

F4.1 The parallel leaf membrane element consists of a membrane permanently joined to a rigid flat support plate that provides integrity of geometry and facilitates permeate transport to a collection port (Figure F4.1). A multitude of membrane elements are assembled (stacked) and sealed to each other with an elastomeric ring at the permeate collection port so as to conduct permeate from each membrane element. The membrane element stack is held together with a retaining clamp consisting of two rigid non-porous plates, one on each side of the membrane element stack, and a tie-rod that holds the two rigid plates together at their center, and protruding through the permeate collection ports so as to provide a common permeate collection port for the membrane element stack (Figure F4.2). The geometry of the membrane elements is such as to form retentate flow channels in between the membrane elements. A variant is to have retentate flow channels formed with the insertion of a channel spacer, such as a monofilament mesh of a size selected to maintain the desired flow channel height.

F4.2 Several of these assemblies, or "membrane cartridges," (each consisting of a multitude of membrane elements, inter-element elastomeric seals, and retaining clamp) are inserted, end to end, in a close fitting pressure vessel (shroud) equipped with a feed connection, a retentate connection, and permeate connections for each membrane cartridge. Each cartridge is mechanically held and sealed in place with a permeate fitting. Frequently a bypassing flow restrictor is inserted upstream of each membrane cartridge for the purpose of increasing/directing feed flow through the cartridge flow channels. A permeate manifolding system, including anti-flow-reversal valves for each cartridge, collects permeate from each cartridge containing pressure vessel with feed and retentate connections, together with the permeate manifold system, constitute the membrane module (Figure F4.3).

F4.3 Pressurized feed enters the membrane module through the feed connection, flows through the membrane element retentate flow channels (over the membrane), and exits through the retentate connection. Permeate is forced through the permeate fittings into the permeate manifold.

F5 **Hollow Fiber Modules**

F5.1 Hollow Fiber Membrane Elements are self-supporting membrane tube structures that do not require porous support material for mechanical strength. The perm-selective membrane skin on the inside of the fiber and the porous fiber wall are a homogeneous polymer matrix and therefore, act as the pressure vessel. As such, the hollow fiber membrane is cleaned by back-flushing the membrane with cleaning solutions that are recommended by the manufacturer. See 3-A Accepted Practice for the Sanitary Construction, Installation, and Cleaning of Membrane Processing Systems for Milk and Milk Products, 610-. Figure F5.1 is a schematic illustration of a hollow fiber membrane module.

F5.2 A bundle of parallel hollow fiber membrane elements is inserted into a protective membrane sheath which is then sealed into a hydraulically symmetrical shell and tube cartridge by bonding the ends of the fibers in an epoxy resin tube sheet.

F5.3 The fluid being processed flows through the cartridge manifold adapter assembly and enters the lumen or center of the fiber and flows longitudinally down the fiber with the permeate passing radially through the fiber wall and collecting in the "low pressure" or shell side chamber of the membrane cartridge. The retentate exits the other end of the cartridge and is directed to the system retentate/feed lines while the permeate flows out of the permeate outlets of the cartridge through the permeate adapter assembly into the permeate collection manifold. This membrane cartridge, process manifold and permeate adapter assemblies form the membrane module.

F6 **Monolithic Ceramic Membrane Modules**

F6.1 The monolithic ceramic membrane modules consist of a membrane array of one or more parallel single tubular elements or multi-channel tubular elements or tubular elements in a bundled arrangement in the shroud. The shroud is used to protect the membrane elements and divide the module into feed, retentate and permeate channels and spaces.

F6.2 The membrane elements are self-supporting structures with the membranes on the inside of the flow channels. The outside of the element is the porous support for the membrane and provides mechanical integrity and protection for the membranes. The ends of the membrane elements are generally sealed with a very fine ceramic bonded layer of the same material as used for the membrane but of a greater thickness and a finer pore structure. In alternate designs a self-curing or catalyzed sealant may be used to fill the support structures and seal the membranes to the feed and retentate channel spaces and the permeate spaces.

F6.3 Membrane elements are supported within the shroud by either single element grommets or seals, which may be either O-rings or gaskets, or monolithic precast or cast-in-place rubber-like, plastic-like or epoxy material to form a membrane bundle or a membrane array within the shroud. Fixed retainers may be used to secure the bundle or array firmly to the shroud and removable retainers may be used to secure the element seals, bundle seals, or array seals, as the case may be, to the elements.

F6.4 The geometry of the module is such as to form a channel space to feed products to the membrane elements, a channel space at the discharge of the membrane elements to collect the retentate and provide a flow path to connect to boundary retentate lines, and a permeate space surrounding the outside of the membrane elements to collect the permeate and channel it to one or more permeate connectors at the module boundary lines.

F6.5 Figure F6.1 shows the arrangement of a monolithic ceramic assembly of several multichannel elements. Figure F6.2 shows an alternate design of a monolithic ceramic module element fixturing for one or more multichannel elements. Figure F6.3 shows the principal of the multichannel element. The details of this assembly may vary depending on the design of the elements as single tubular or multichannel and the type of membrane element seals required to support a cast-in-place or pre-cast bundle, or the membrane array-type designs with grommet seals.

G **STAINLESS STEEL MATERIALS**

Stainless steel conforming to the applicable composition ranges established by AISI for wrought products, or by ACI for cast products, should be considered in compliance with the requirements of Section C.1 herein. Where welding is involved the carbon content of the stainless steel should not exceed 0.08%. The first reference cited in C.1 sets forth the chemical ranges and limits of acceptable stainless steels of the 300 series. Cast grades of stainless steel corresponding to types 303, 304 and 316, are designated CF-16F, CF-8, and CF-8M respectively. The chemical compositions of these cast grades are covered by ASTM specifications[4] A351/A351M, A743/A743M and A744/A744M.

Other editorial corrections to modified decimal number system (MDN) and indentations per current model (e.g. C1.1) and change 3-A reference standards' document numbers to the two- or three- digit permanent serial number to be consistent with current practice of using the most current editions of referenced materials, e.g. 3-A Sanitary Standards for..., Number 20-, or 3-A Accepted Practices for ..., Number 605-.

H **PRODUCT CONTACT SURFACE FINISH**

Surface finish equivalent to 150 grit or better as obtained with silicon carbide properly applied on stainless steel sheets is considered in compliance with the requirements of Section D1.6.1 herein.

I **DIAGRAMS**

These diagrams are intended to demonstrate general principles only, and are not intended to limit individual ingenuity. The design used should conform with the sanitary requirements set forth in these 3-A Sanitary Standards. The following examples are included in this Appendix:

[1]Use current revisions or editions of all referenced documents cited herein.

[2]The data for this series are contained in the AISI Steel Products Manual, Stainless & Heat Resisting Steels, November 1990, Table 2-1, pp.17-20. Available from the American Iron and Steel Society, 186 Thorn Hill Road, Warrendale, PA 15086; 724.776.1535.

[3]Steel Founders' Society of America, Cast Metals Federation Bldg., 455 State St., Des Plaines, IL 60016; 312.299.9160.

[4]Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959; 610.832.9500.

These 3-A Sanitary Standards are effective November 21, 1999 at which time the 3-A Sanitary Standards for Crossflow Membrane Modules, Number 45-00, are rescinded and become null and void.

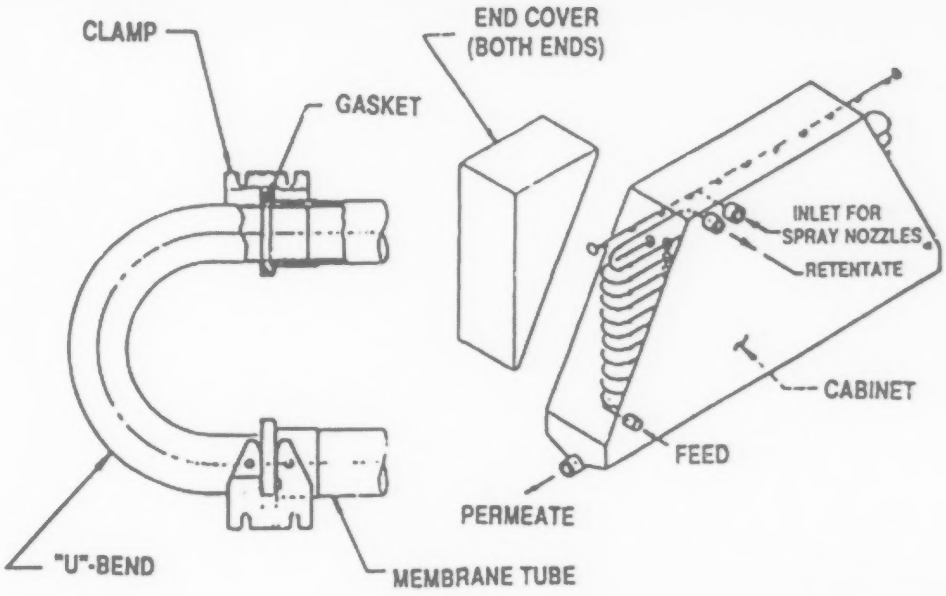


Figure F.1.1

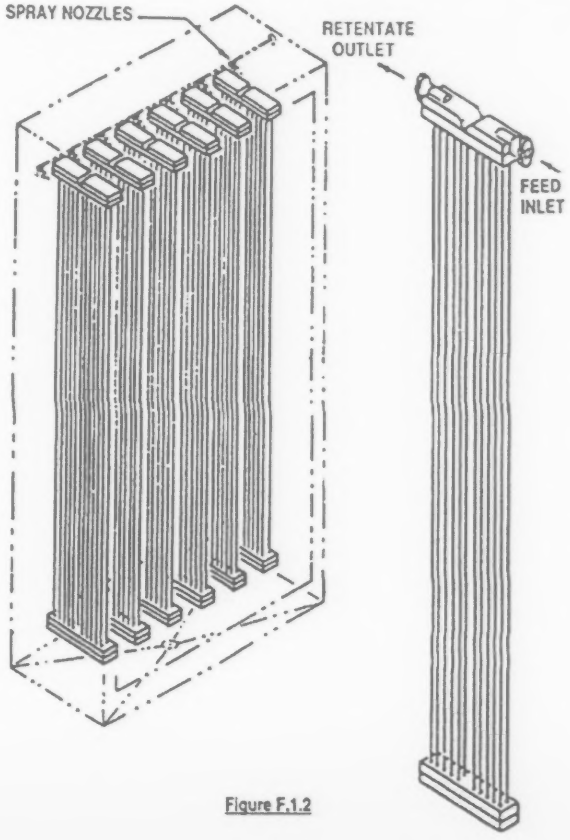
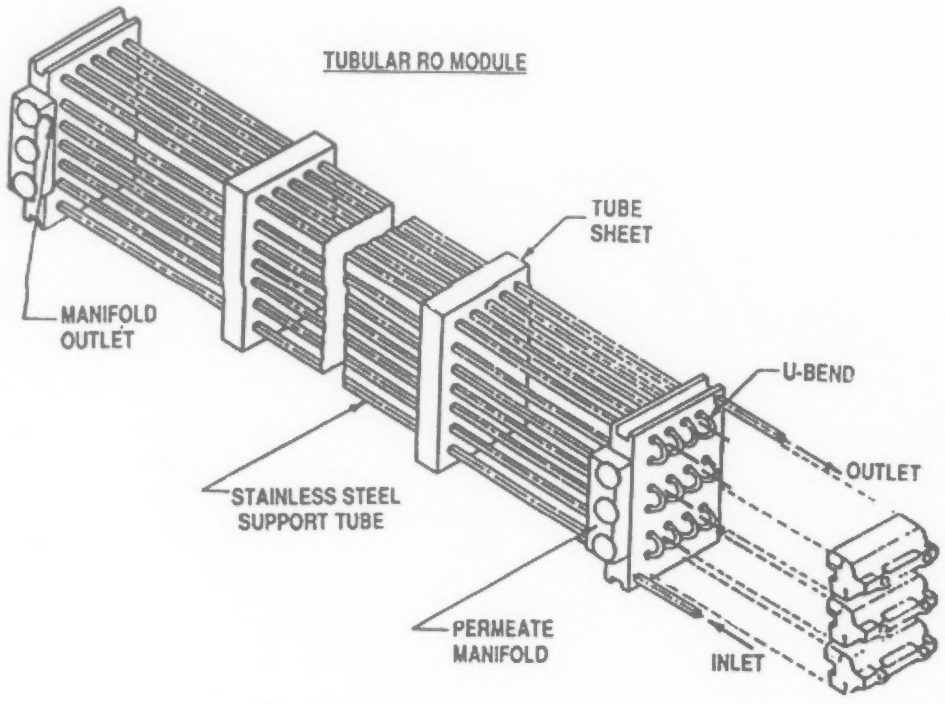


Figure F.1.2

Figure F.1.3



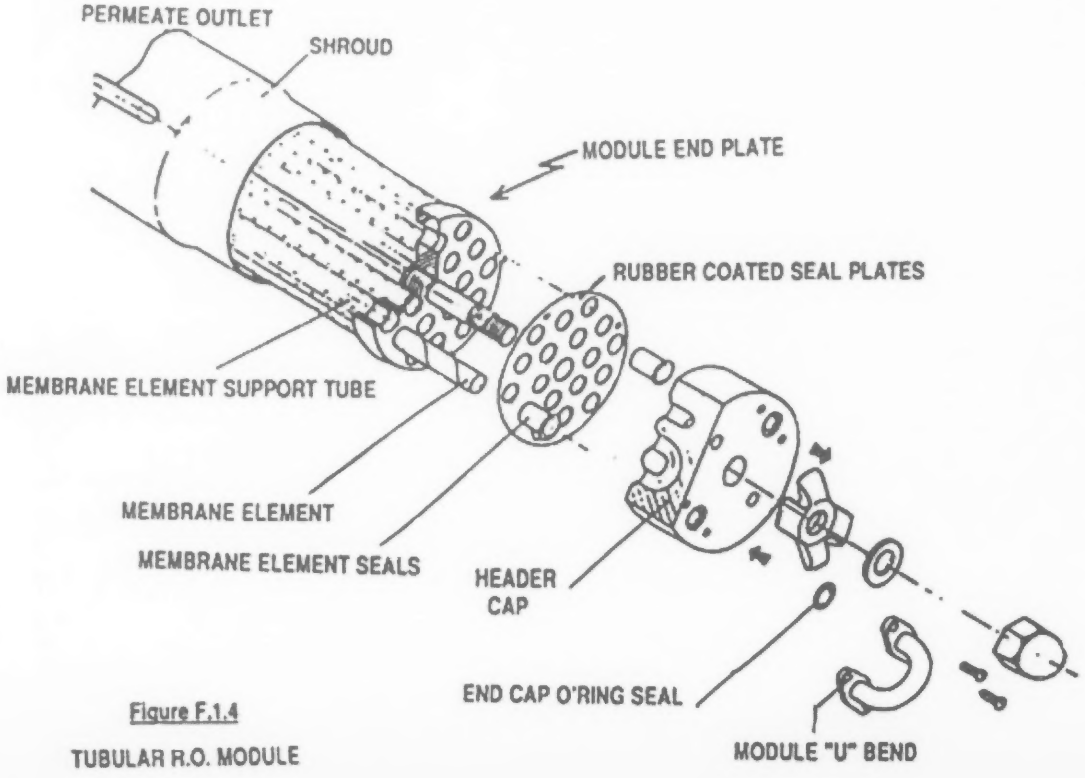


Figure F.1.4

TUBULAR R.O. MODULE

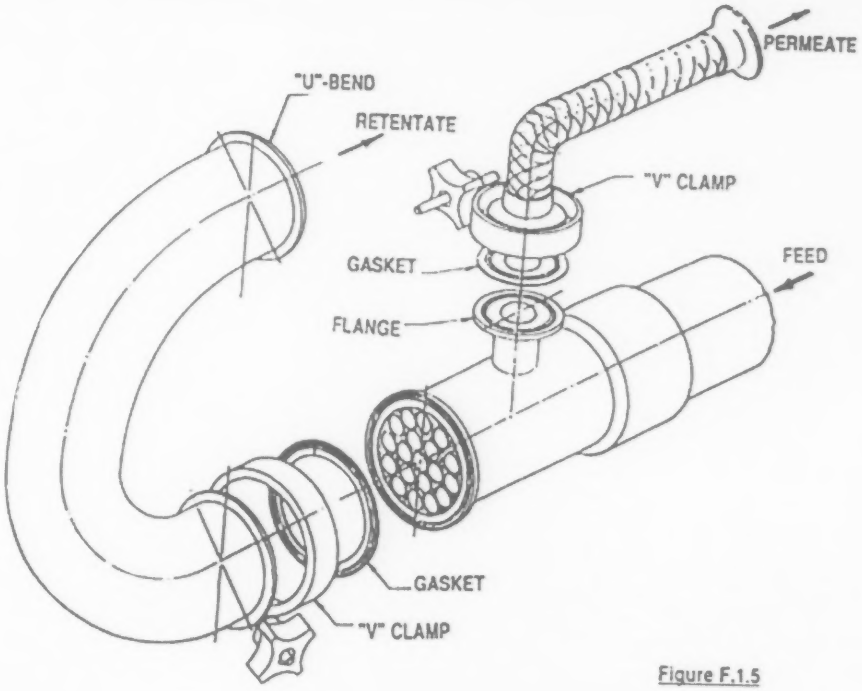


Figure F.1.5

SUPPORTED METALLIC OXIDE MODULE
ULTRA AND MICROFILTRATION

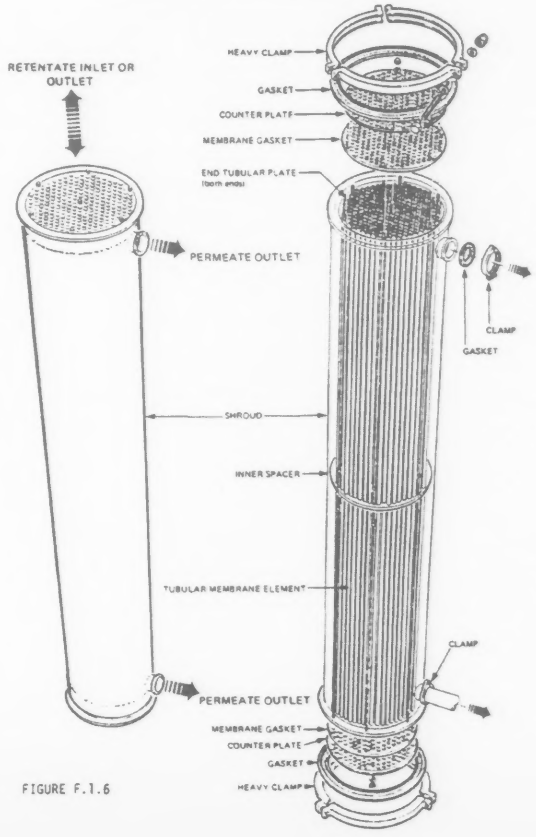


FIGURE F.1.6

SPIRAL WOUND MEMBRANE MODULE

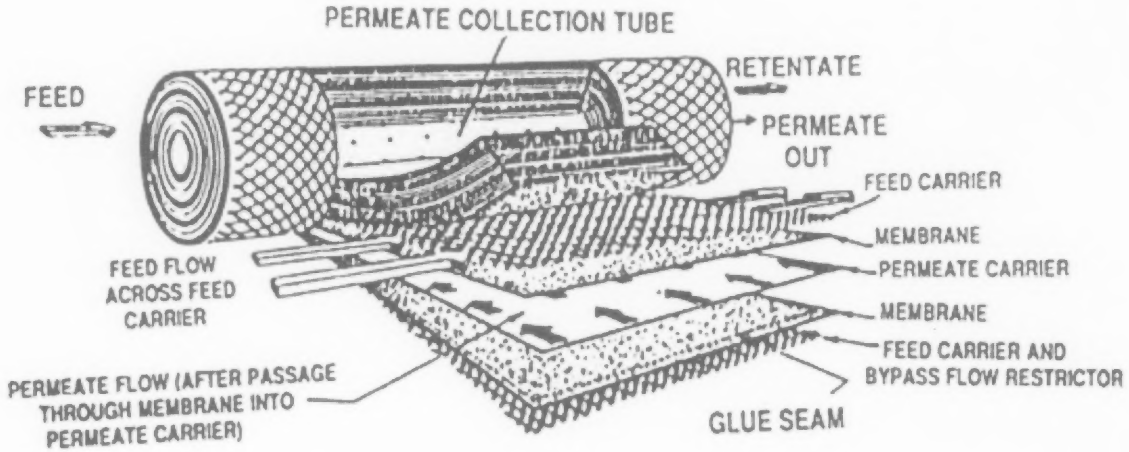


Figure F.2.1

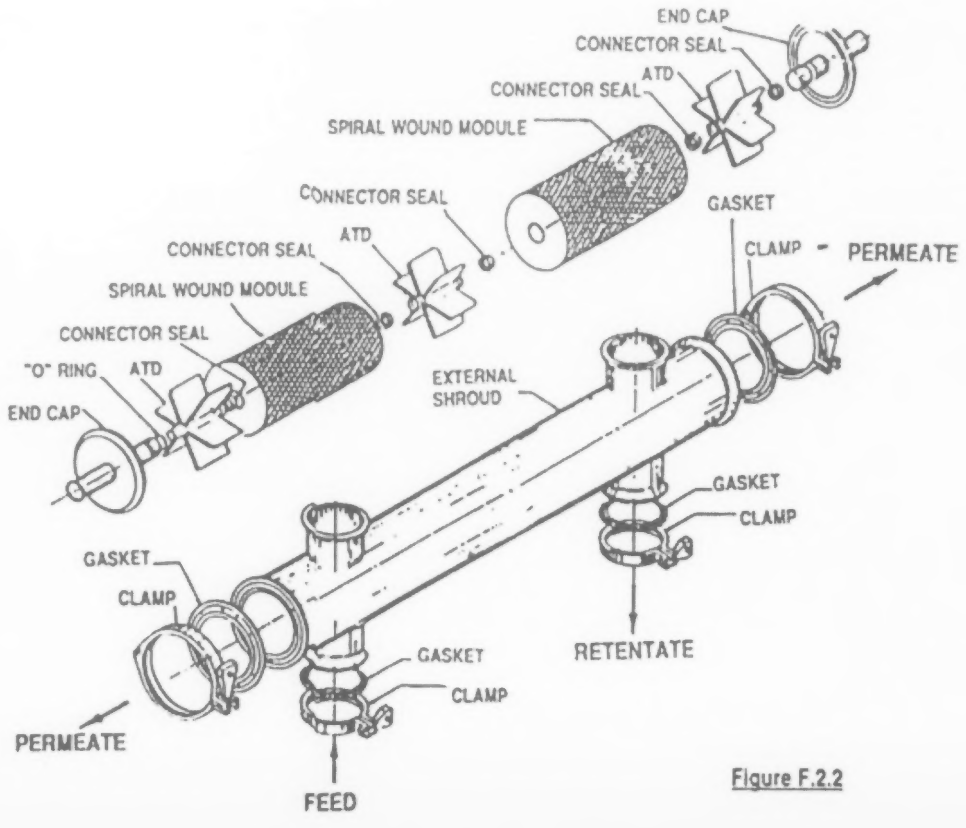


Figure F.2.2

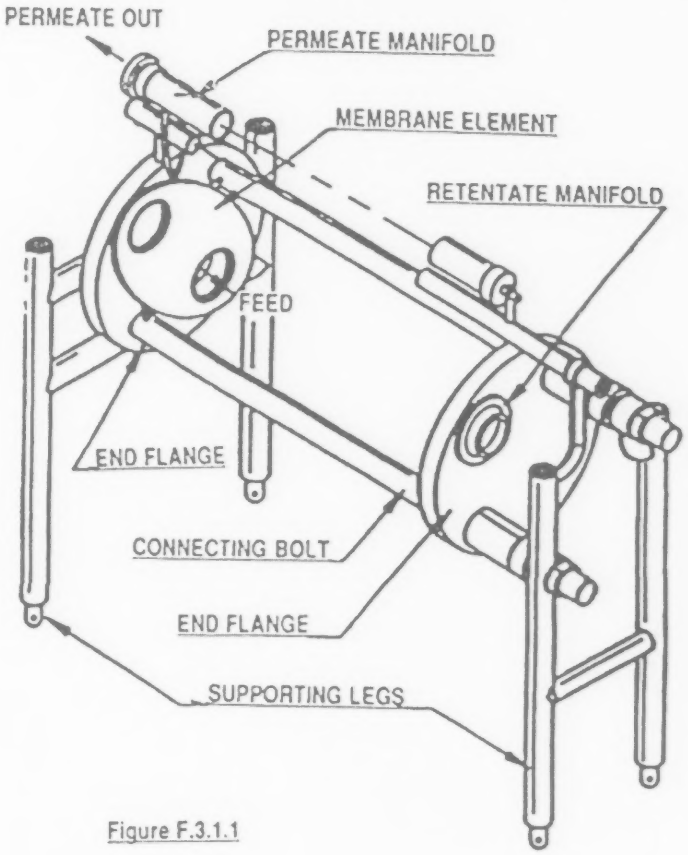


Figure F.3.1.1

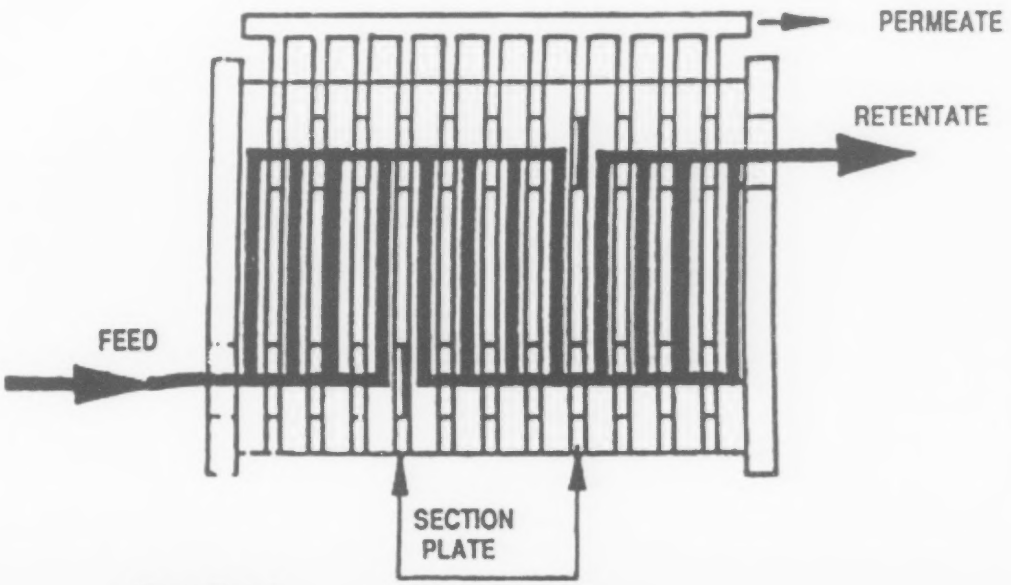


Figure F.3.1.2

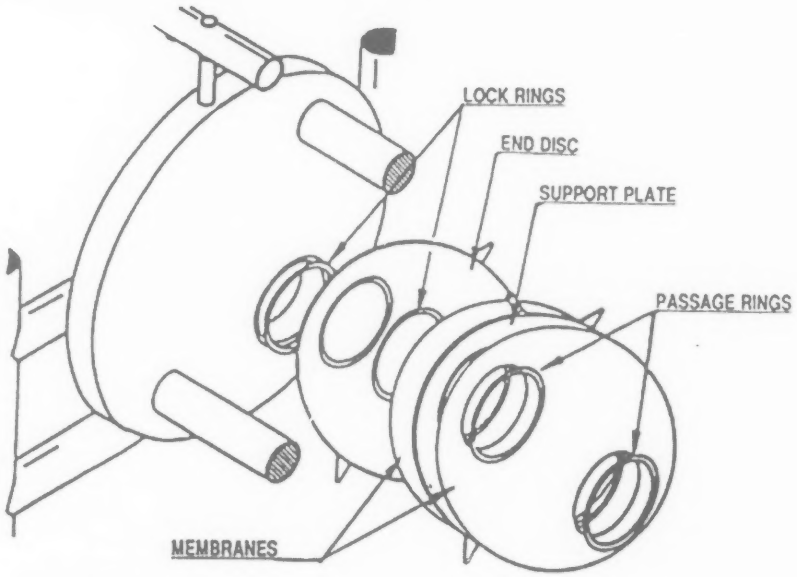


Figure F.3.1.3

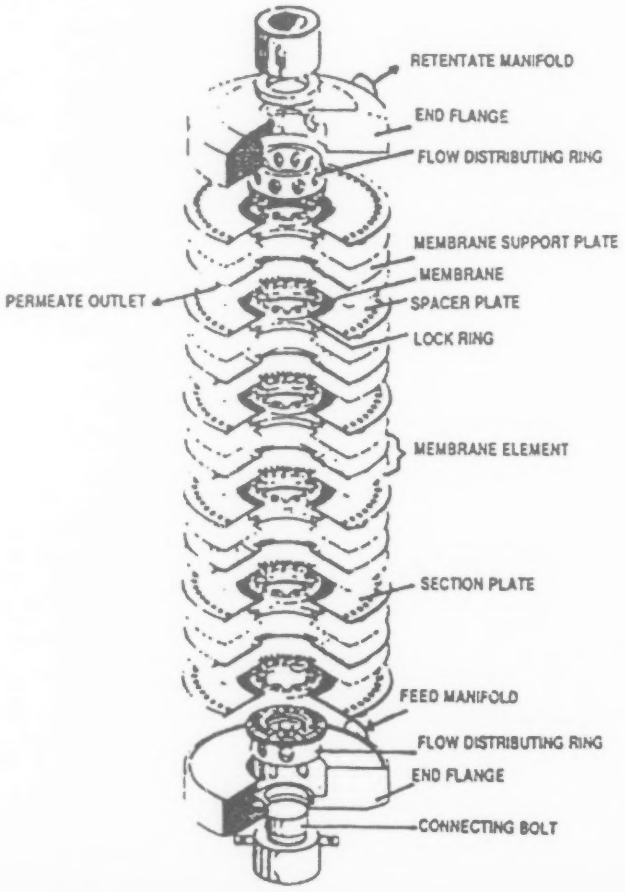


Figure F.3.1.4

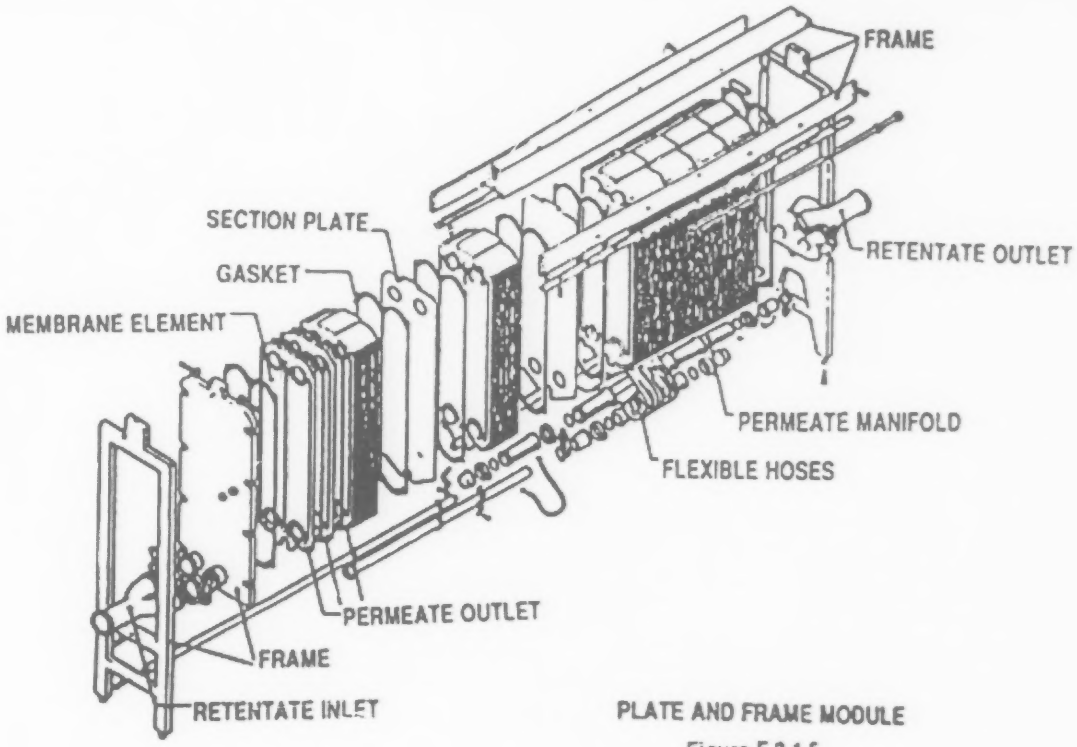
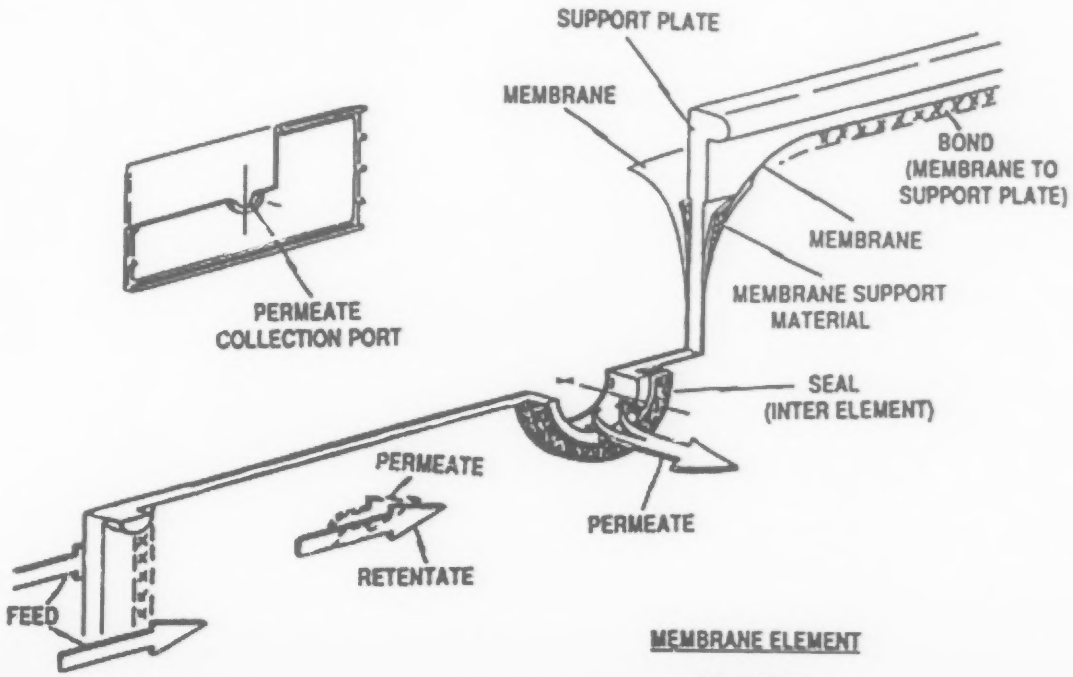


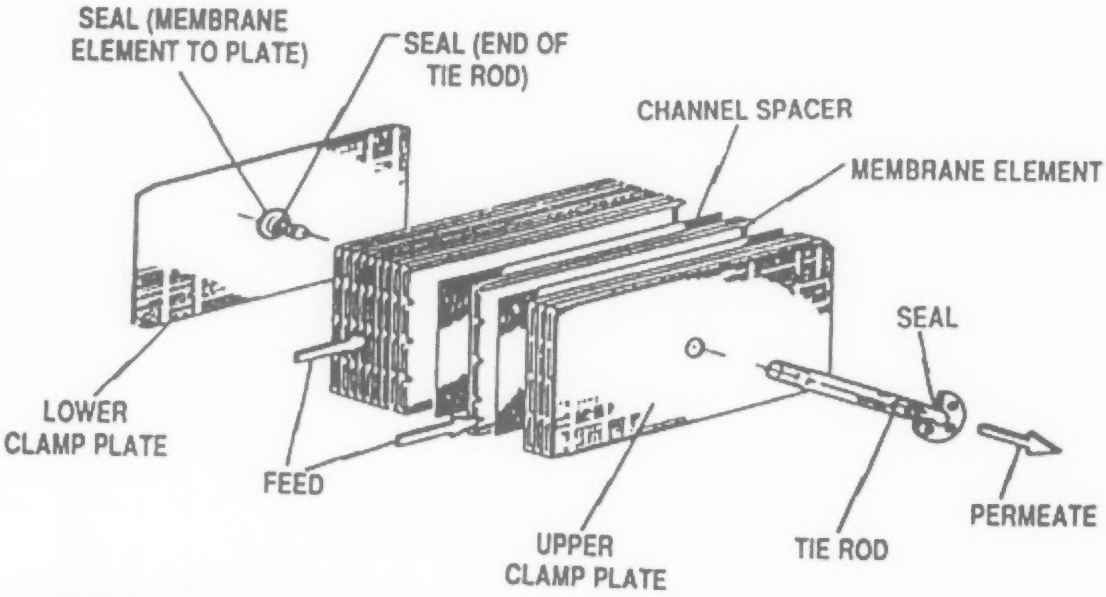
PLATE AND FRAME MODULE

Figure F.3.1.5



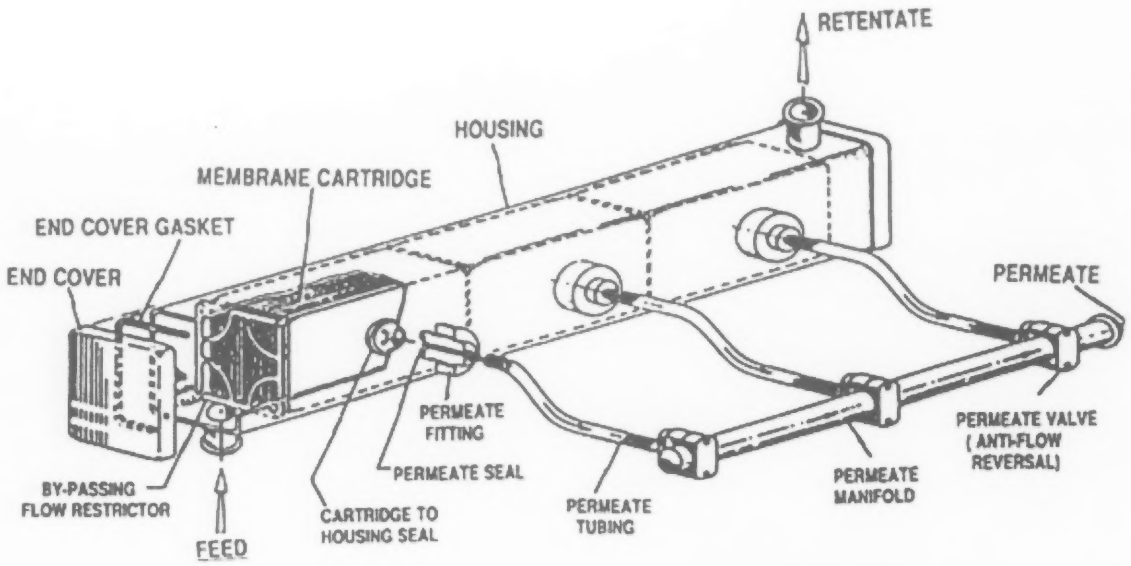
MEMBRANE ELEMENT

Figure F.4.1



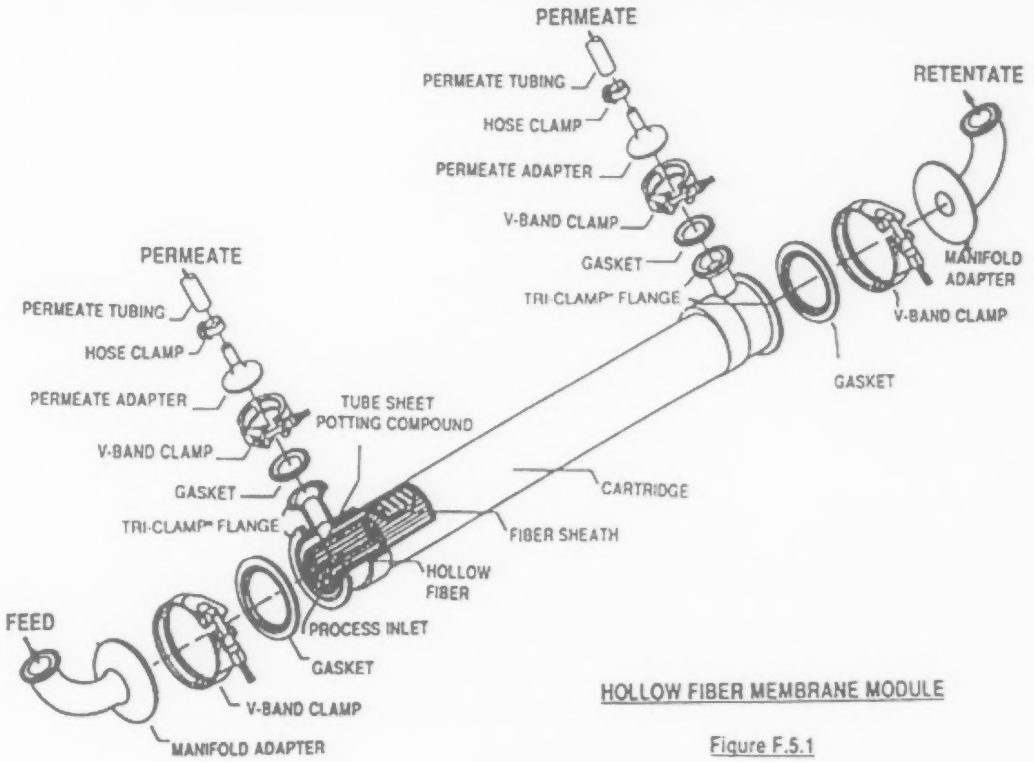
MEMBRANE ELEMENT STACK

Figure F.4.2



MEMBRANE MODULE

Figure F.4.3



HOLLOW FIBER MEMBRANE MODULE

Figure F.5.1

MONOLITHIC CERAMIC MODULE
ASSEMBLY OF SEVERAL MULTICHANNEL ELEMENTS

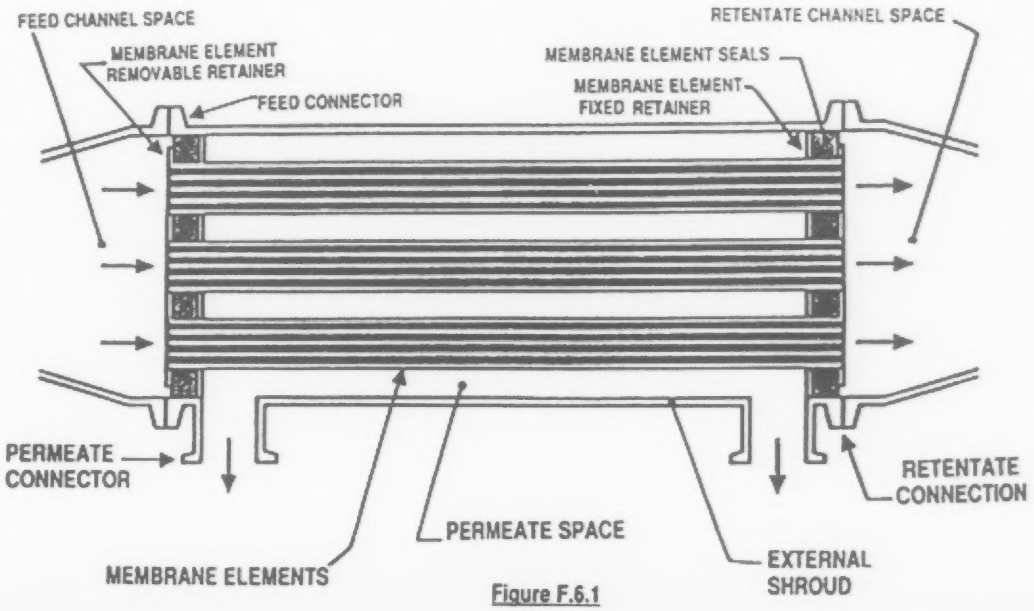


Figure F.6.1

MONOLITHIC CERAMIC MODULE
MEMBRANE ELEMENT FIXTURING FOR ONE OR
MORE MULTICHANNEL ELEMENTS

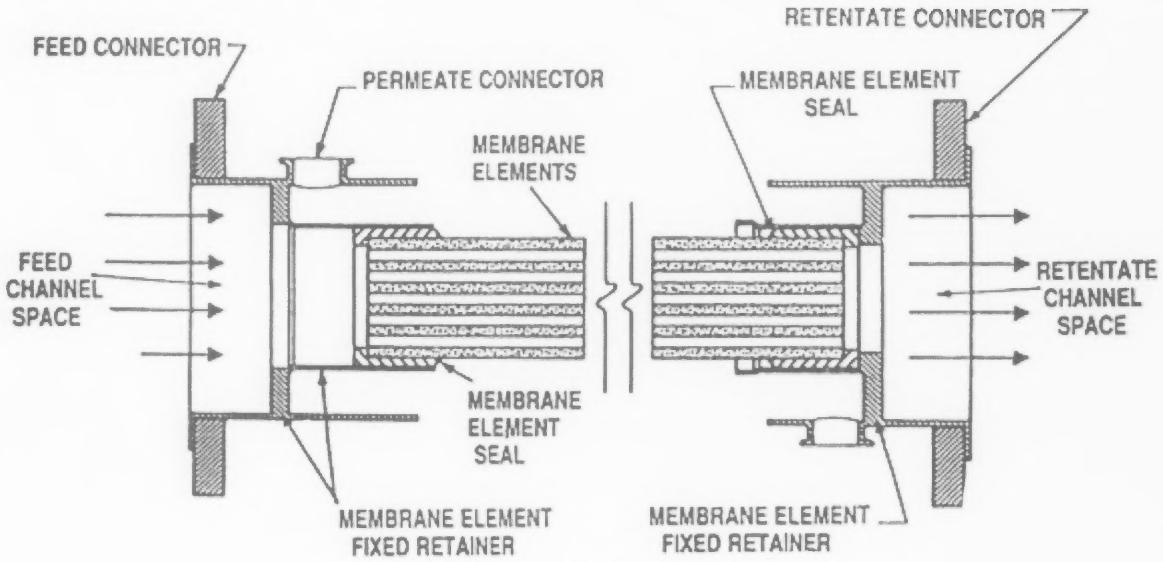
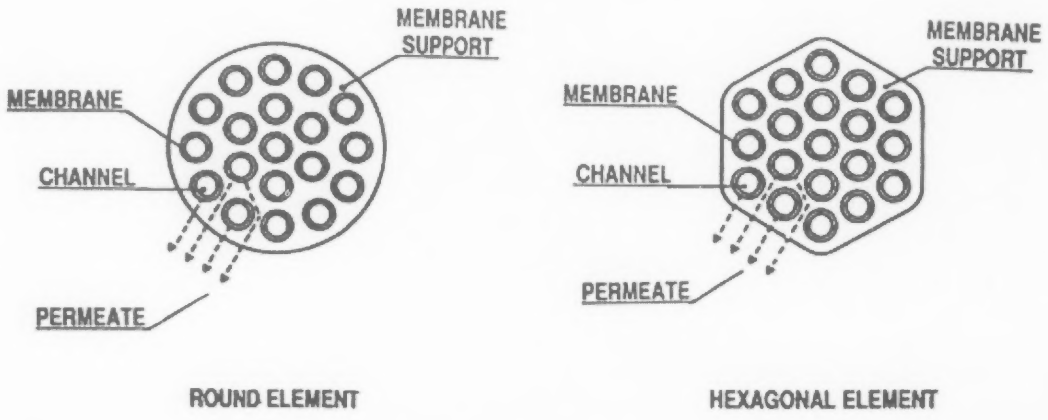


Figure F.6.2

MONOLITHIC MEMBRANE MODULE
PRINCIPLE OF THE MULTICHANNEL ELEMENT



ROUND ELEMENT HEXAGONAL ELEMENT

Figure F.6.3

ADVERTISING INDEX

ComingEvents

FEBRUARY

·**16-17, California Association of Dairy and Milk Sanitarians,** Sacramento, CA. For further information, contact John Bruhn at 530.752.2192; E-mail: jcbruhn@ucdavis.edu.

·**22, Georgia Association of Food and Environmental Sanitarians Meeting,** at the Radisson North Druid Hills, Atlanta, GA. For information contact Sid Camp at 404.765.9000.

·**25-26, Korea Association of Milk, Food and Environmental Specialists.** For additional information, contact Deog-Hwan Oh at 82.361.250.6457.

·**28-29, Principles of Warehouse Sanitation Seminar,** Manhattan, KS. For additional information, contact AIB, 1213 Bakers Way, Manhattan, KS 66505-3999; Phone: 785.537.4750; Fax: 785.537.1493.

·**29-March 1, Summit III Foodborne Pathogens in Poultry,** Atlanta Airport Hilton, Atlanta, GA. For additional information, contact John M. Todd at 815.734.4171; Fax: 815.734.4201.

MARCH

·**3, Baking Industry Sanitation Standards Committee (BISSC) 2000 Annual Membership Meeting,** at the Chicago Marriott Hotel, Chicago. For more information, contact Bonnie Sweetman, Executive Director, BISSC, 1400 W. Devon Ave., Suite 422, Chicago, IL 60660; Phone: 773.761.4100; Fax: 773.274.3242; E-mail: bakesan@aol.com.

·**7-8, Basic Food Microbiology Seminar,** Holiday Inn – Portland Airport, Portland, OR. Designed for those who work with food processing, preparation, or sanitation, but have a limited background in microbiology. For additional information, contact Jack Brook, Science Division, Mt. Hood Community College, 26000 SE Stark St., Gresham, OR 97030; Phone: 503.491.7473; E-mail: brookj@mhcc.cc.or.us.

·**9-11, International Fresh-cut Produce Association's 13th Annual Conference and Exhibition, "Dallas 2000: the Future is Now,"** Dallas, TX. This conference will provide fresh-cut processors, their suppliers, and their customers with an in-depth understanding of internal and external factors that will change the industry as it enters the twenty-first century. For more information, call Sherry Greenwood at 703.299.6282.

·**15, Dairy HACCP Workshop,** Madison, WI. This one-day workshop will cover design and implementation of HACCP plans in dairy plants. For additional information, contact Marianne Smukowski at 608.265.6346.

·**15-16, Carolinas Association of Milk, Food and Environmental Sanitarians.** For additional information, contact Joe Neely, SCDHEC Division of Environmental Health, 2600 Bull St., Columbia, SC 29201; Phone: 803.935.7890.

·**20-22, Principles of Quality Assurance Seminar,** Manhattan, KS. This seminar will review basic HACCP principles to help you understand the concepts and their practical uses. The hands-on workshop assists participants in developing a HACCP program and reviewing its strenghts and weaknesses. For more information, contact AIB, 1213 Bakers Way, P.O. Box 3999, Manhattan, KS 66505-3999; Phone: 785.537.4750; Fax: 785.537.1493.

·**30, British Columbia Food Protection Association First Annual Speaker's Evening** at the Executive Plaza in Coquitlam, British Columbia, Canada. For further information, contact Clive Kingsbury at 604.576.1911, ext. 3740.

APRIL

·**6-9 IAFIS Annual Conference,** The Westin LaPaloma, Tucson, AZ. For further information, contact Dorothy Brady at 703.761.2600.

·**7-12, 2000 Conference for Food Protection,** Hyatt Regency Hotel, Milwaukee, WI. For additional information, contact Trevor Hayes, CFP Executive Secretary, 1085 Denio Ave., Gilroy, CA 95020-9206; Phone/Fax: 408.848.2255; E-mail: TWHgilroy@aol.com.

·**12, Metropolitan Association of Dairy, Food and Environmental Specialists Annual Spring Conference,** Victorian Manor, Edison, NJ. For further information, contact Fred Weber at 609.584.7677.

·**12-14, Michigan Environmental Health Association 55th Annual Conference,** Sault Ste. Marie, MI. For further information, contact Chuck Lichon at 517.832.6656.

·**13, Kansas Association of Sanitarians Spring Meeting,** at Mount Conference Center, Atchinson, KS. For additional information, contact Chris McVey at 316.342.4864.

·16-19, **Foodborne Pathogens 2000: Perspectives and Interventions,** Crowne Plaza, Arlington/Crystal City, VA. Sponsored by the Society for Industrial Microbiology. For more information, contact 3929 Old Lee Highway, Suite 92A, Fairfax, VA 22030-2421; Phone: 703.691.3357; Fax: 703.691.7991; E-mail: info@simhq.org.

·27, **Indiana Environmental Health Association, Inc., Spring Educational Conference** at Valle Vista in Greenwood. For additional information, contact Helene Uhlmann at 219.853.6358 or Bob Schmidt at 812.349.2542.

MAY

7-11, 8th World Salt Symposium Salt 2000, in The Hague. Participants will be informed of the developments that are important for their respective activities in relation to salt. For further information, contact Dr. Justus M. de Jong, Phone: 31.74.2443908; Fax: 31.74.2443272; E-mail: Salt.2000@inter.NL.net.

·7-12, **3-A Sanitary Standards Annual Committee Meetings,** Four Point Sheraton Hotel, Milwaukee, WI. For additional information, contact Philomena Short at 703.761.2600.

13-17, Dietary Fibre – 2000, Dublin, Ireland, Berkeley Court Hotel, Dublin. For additional information, contact Amy Hope, American Association of Cereal Chemists, 3340 Pilot Knob Road, St. Paul, MN 55121-2097; Phone: 651.454.7250; Fax: 651.454.0766; E-mail: aacc@scisoc.org.

International Association for
Food Protection
Formerly IAMFES

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	Procedures to Investigate Waterborne Illness—2nd Edition	$10.00	$20.00	
	Procedures to Investigate Foodborne Illness—5th Edition	10.00	20.00	
	Procedures to Investigate Arthropod-borne and Rodent-borne Illness	6.00	12.00	

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OTHER PUBLICATIONS

Quantity	Description	Member or Gov't. Price	Non-Member Price	TOTAL
	Pocket Guide to Dairy Sanitation (minimum order of 10)	$ .50	$ .75	
	Before Disaster Strikes...A Guide to Food Safety in the Home (minimum order of 10)	.50	.75	
	*Developing HACCP Plans – A Five-Part Series (as published in *DFES*)	15.00	15.00	
	*Surveillance of Foodborne Disease – A Four-Part Series (as published in *JFP*)	18.75	18.75	
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3-A SANITARY STANDARDS

Quantity	Description	Member or Gov't. Price	Non-Member Price	TOTAL
	Complete Set 3-A Dairy & Egg Standards	$125.00	$250.00	
	Five-year Update Service on 3-A Dairy & Egg Standards (new and revised standards only)	165.00	330.00	

SHIPPING AND HANDLING – Each set $6.25 (US) $10.25 (Outside US)

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3-A Sanitary Standards Total _____

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Payment Must be Enclosed for Order to be Processed
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Fax: 515.276.8655
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MEMBERSHIP APPLICATION

International Association for
Food Protection
Formerly IAMFES

6200 Aurora Avenue, Suite 200W
Des Moines, IA 50322-2863, USA
Phone: 800.369.6337 • 515.276.3344
Fax: 515.276.8655
E-mail: info@foodprotection.org
Web site: www.foodprotection.org

MEMBERSHIP DATA:

Prefix (❒ Prof. ❒ Dr. ❒ Mr. ❒ Ms.)

First Name _____ M.I. _____ Last Name _____

Company _____ Job Title _____

Mailing Address _____

(Please specify: ❒ Home ❒ Work)

City _____ State or Province _____

Postal Code/Zip + 4 _____ Country _____

Telephone # _____ Fax # _____

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MEMBERSHIP CATEGORIES:

	US	Canada/ Mexico	International
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❒ **Membership with *DFES*** (12 issues of *Dairy, Food and Environmental Sanitation*)	$85.00	$95.00	$110.00
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***Student Membership**			
❒ *JFP* and *DFES*	$70.00	$95.00	$140.00
❒ *Journal of Food Protection*	$42.50	$57.50	$87.50
❒ *Dairy, Food and Environmental Sanitation*	$42.50	$52.50	$67.50

***Full-time student verification must accompany this form**

All Prices Include Shipping & Handling

TOTAL MEMBERSHIP PAYMENT:

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(Prices effective through August 31, 2000)

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