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DAIRY, FOOD AND ENVIRONMENTAL

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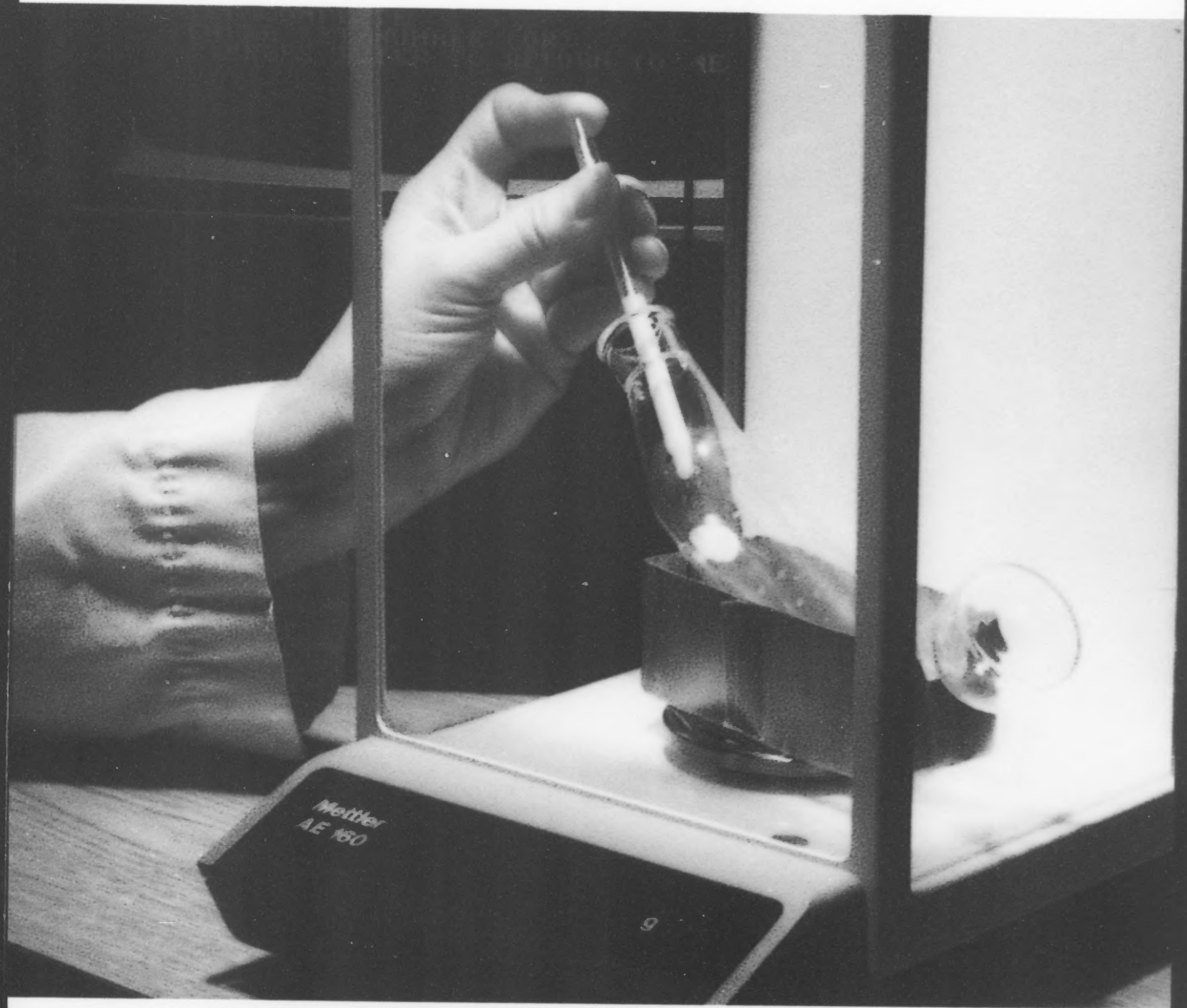
MAY 1993



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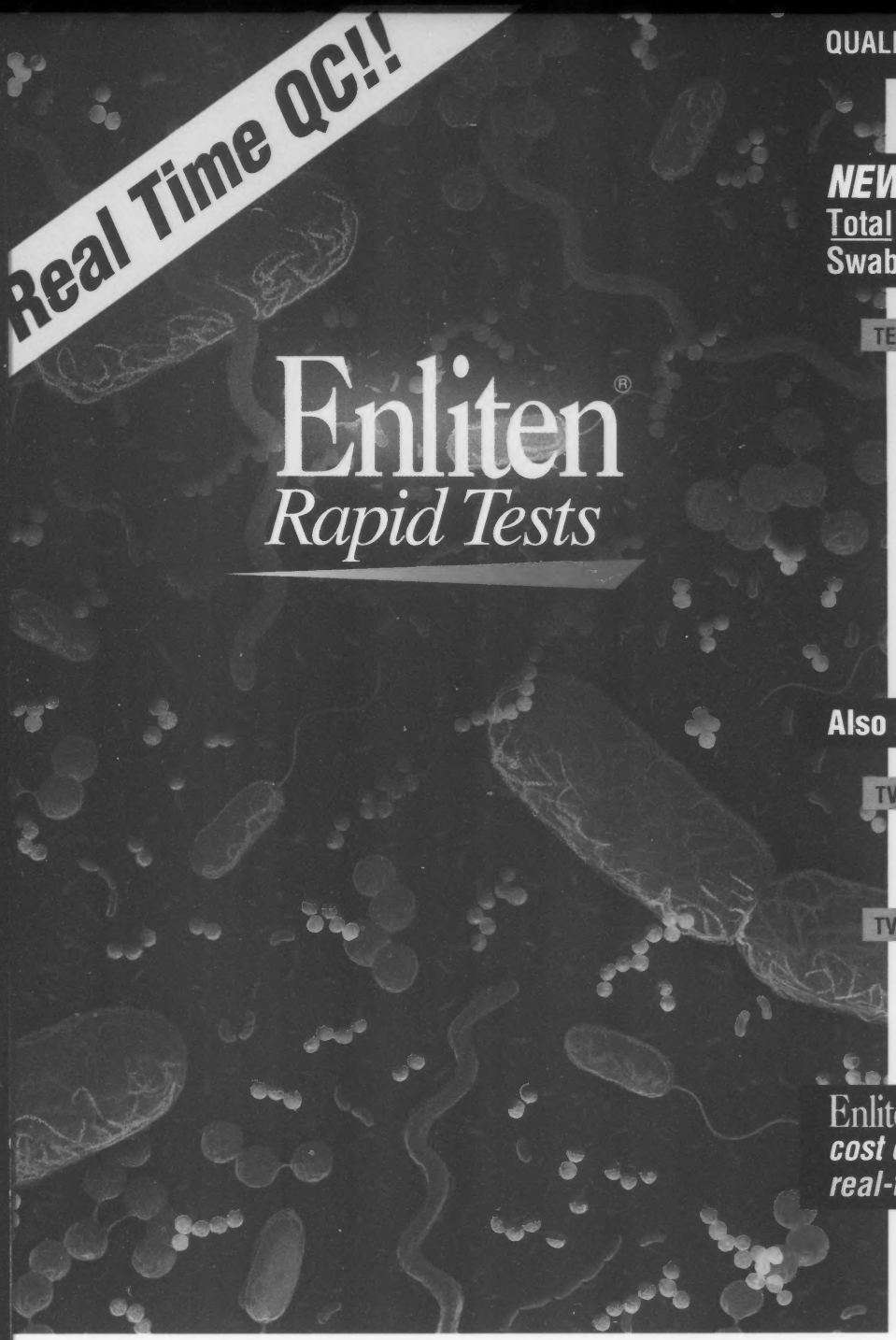

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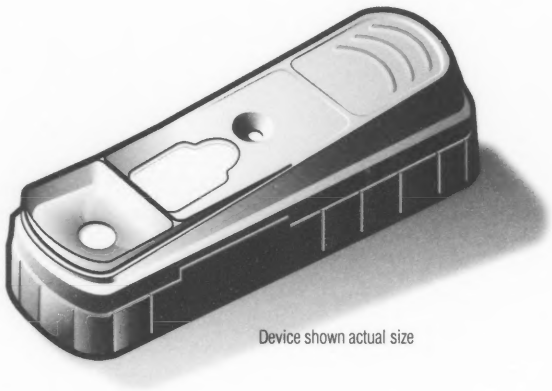

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Thoughts From the President . . .

By
Michael P. Doyle
IAMFES President

See You in Atlanta

If you are contemplating attending the IAMFES Annual Meeting, don't give it a second thought and register today. This year's Annual Meeting promises to be an event you will long remember. Excellent science, great food, and good fun will top the agenda.

Kicking off the meeting will be our Ivan Parkin Lecturer, Dr. Morris Potter, who will share with us his wit and insightful thoughts as he describes the experiences of the epidemiologic sleuths of the Centers for Disease Control and Prevention who unravel the mysteries of foodborne outbreaks. This will lead into one of the most powerful scientific programs any professional society has ever convened on the microbiological safety of foods. Thanks in large part to the efforts and contributions of the International Life Sciences Institute and the input of the IAMFES Program Committee, this year's program will be dominated by a cast of internationally recognized experts presenting papers on a variety of timely food safety issues and concerns.

Don't forget to bring the family. Everyone will enjoy the night at Stone Mountain, which is truly one of the wonders of the South. This is one rock you won't forget! In addition, we were very fortunate to have connections (thank you Ruth Fuqua and Joe Huseman) to the front office of the National League Champion Atlanta Braves. We were able to secure 300 tickets to a game (Tuesday night) with the Philadelphia Phillies. Braves tickets are extremely difficult to come by this year, and out allotment is going fast. Order your tickets today. Anyone attending the game will be required to participate in a 15-minute workshop on the tomahawk chop. This session will be held immediately before the buses depart.

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ABOUT THE COVER . . . *Photo courtesy of Dairy Quality Control Institute, 5205 Quincy Street, St. Paul, MN 55112-1400; (612)785-0484.*

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On My Mind . . .

By
Steven K. Halstead, CAE
IAMFES
Executive Manager

. . . is the Annual Meeting

I had a call last week--one of those kinds of calls you love to receive — from Catherine Nnoka of the International Life Science Institute of North America (ILSI) volunteering a speaker on the topic of "Cryptosporidium." She said that ILSI would provide someone if we had any interest in the topic.

By way of background information for those of you who are not familiar with the process, each year the Program Advisory Committee establishes one symposium for late breaking items of interest in food safety. One of the items that they identified as a potential topic for the symposium on "Selected Topics in Food Safety" was "The Next Emerging Pathogen: Cryptosporidium." Now, mind you, the PAC met in mid-January this year. Talk about prophetic! Are these people good or what?

Then came the Milwaukee outbreak! It is currently reported that between 250,000 and 400,000 people have contracted the disease.

We quickly put into place the effort to accept ILSI's offer and with great anticipation we look forward to hearing Joan B. Rose talk about this pathogen and in particular the latest findings from the Milwaukee episode.

We already had lined up several speakers on *E. coli* and, of course, we expect that these people will be sharing with you research that has been done on the recent Jack-In-The-Box outbreak in Washington, Oregon and Utah where over four hundred people reported symptoms and three children died.

All this, is my way of saying: "Get ready for an outstanding educational program." Not only will you find the "typical" research oriented presentations as in the past, but we will also see topics that we are learning about nearly daily in the newspaper and on the radio or TV. How more timely can you be than that?

Tuesday afternoon's General Session "Communicating Food Safety in the News" promises to be an outstanding program. We will ask the media to investigate it's role in food safety education. A part of that will be to help us identify what the media expects from us as they fulfill their role. At this particular time, we are not able to release the names of the speakers, but I guarantee you they will be names you have heard.

President Michael P. Doyle, in his column this month, informs you that we have a very limited number of tickets for the Atlanta Braves/Philadelphia Phillies baseball game. The $18.00 price provides transportation and a ticket to the ballgame. At that price, the 300 we have won't last long, so send in your money now if you want to be sure of getting one.

He also points out that he will be teaching all attendees the famous Braves Tomahawk Chop. I would suggest, that given our profession, we may want to learn the "Sanitizing Stomp" instead.

I would like to take this opportunity to put to rest once and for all the rumor that the Atlanta Braves are subsidizing our meeting in an effort to win this year's World Series. As scientists, we know that just because the Toronto Bluejays won the series after hosting the IAMFES meeting doesn't mean that the Atlanta Braves can expect the same thing to happen. On the other hand....

Dairy, Food and Environmental Sanitation, Vol. 13, No. 5, Pages 272-275 (May 1993)

GLPs — What are they? And how can they help food processors?

Richard F. Stier, Trean K. Blumenthal and Michael M. Blumenthal, Ph.D.,
Libra Laboratories, Inc., 16 Pearl Street, Metuchen, NJ 08840-1816

What are "Good Laboratory Practices?" As with many things, there may be different interpretations to define a "Good Practice." The Code of Federal Regulations defines "Good Laboratory Practices for Non-clinical Studies" in Part 58.1-58.219. That section of the CFR "prescribes good laboratory practices for conducting non-clinical studies that support or are intended to support applications for research or marketing permits for products regulated by the Food and Drug Administration, including food and color additives, animal food additives, medical devices for human use, biological products and electronic products. Compliance with this part is intended to assure the quality and integrity of safety data."

These regulations are a critical tool available to the F.D.A. to be used in assuring the safety of foods and food additives (and other materials under their jurisdiction). The regulations were enacted to assure that those companies involved in the development of new ingredients or additives follow established protocols in evaluating the safety of their new products. They must also rigorously document that these protocols have been followed.

The records and experimental design are available for review by F.D.A. investigators. These records must stand up to scrutiny when examined by the agency and when the company files an application to have the material approved for use in the food system. The GLP regulations do not, however, apply to all food laboratories, but only those facilities involved in the development of food ingredients or additives. The product development programs for a major food processor, such as a bakery or snack food producer, whose goal is to produce new or cost-reduced products would usually not be involved in projects covered by these regulations, though they may have to comply with GMP requirements. Companies actively involved in developing new additives or ingredients (fat or sugar substitutes, for example) or performing safety evaluations would be involved in the regulated program.

Regulations are by definition promulgated by federal agencies to allow enforcement of acts of Congress. This is the role of the GLPs. The GLPs contain a number of sections. The first section following the scope cited above includes definitions. When developing the regulations, the F.D.A. recognized the importance of quality assurance. The Quality Assurance Unit is defined as:

"Any person or organizational element, except the study director, designated by the testing facility management to perform the duties of non-clinical laboratory studies."

"Quality assurance" is further detailed in the following paragraphs.

Subpart B in the CFR describes the "Organization and Personnel." The regulations detail that persons involved in the study should have proper training and education, that there should be adequate staff to conduct the work and that proper safety precautions be taken. There are also descriptions of what is required of management and the study director to assure the work is properly conducted. Finally, the regulations describe the quality assurance function. The Quality Assurance Unit must be composed of individuals who are responsible for monitoring each study to assure conformance with the regulations. This unit "shall be entirely separate from and independent of the personnel engaged in the direction and conduct of the study." This independence is essential for objectivity in audit and review of the safety study activities. This is parallel to the reasoning that says the Quality Unit must be independent of the Production Unit in the manufacturing function.

The responsibilities of the Quality Assurance Unit are to:

1. Maintain a master schedule of all studies being conducted.
2. Maintain copies of all protocols.
3. Inspect each phase of the study to assure compliance with requirements.
4. Submit status reports to management.
5. Determine that there were no deviations from established protocols without authorization and approval.
6. Review the final reports to assure they correctly reflect the data.
7. Prepare a report describing inspections and findings.
8. Maintain the records.

Other parts in the regulations include descriptions of facilities, equipment, testing facilities operation, test articles and controls, protocol for and conduct of a non-clinical laboratory study, records and reports, and disqualification of testing facilities.

As mentioned, most laboratories involved in the food industry are not required to comply with the regulations described in 21 CFR Part 58 "Good Laboratory Practices for Nonclinical Studies," but the ideas and concepts within should be put to use in all laboratories.

Reprinted from Baking & Snack, December 1992

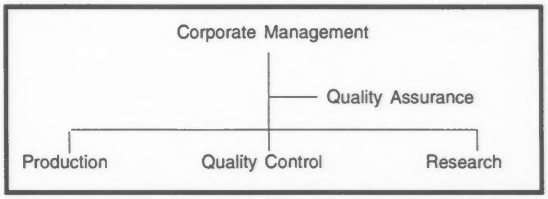
Applied to Food Processing

Although the federal GLPs do not apply to most food laboratories, each facility should employ good laboratory practices. Why? There are many reasons to develop and maintain good practices. These include legal requirements, protocols to assure safety and reduce liability, control of processes, unit operations and product quality, even building design and maintenance. The bottom line, however, is economics. Without an understanding of what is being done, how it is done, and where responsibilities lie, companies are simply asking for trouble ... trouble in the form of recalls, adverse publicity, worker injury, environmental problems or product quality. Food processors are in business to sell food, and troubles such as these tend to hinder that goal.

How can the GLPs be applied to building and/or maintaining a quality control, analytical, or research laboratory in the food industry? The way to develop anything is with organization and personnel. This begins with management.

Management must firmly support the laboratory effort, and must be cognizant of the importance of separating laboratory work from other activities. A simple organization chart (Figure 1) highlights this point.

Figure 1



The organizational chart is, perhaps, oversimplified, but the point is that the different groups must be separate; working toward a common goal but separate. Production and Quality Control must adhere to Good Manufacturing Practices (GMPs) to satisfy regulations. Quality Control and Research must adhere to Good Laboratory Practices (GLPs) to satisfy internal needs and regulatory requirements when applicable. Quality Assurance is responsible for monitoring compliance to each of these programs.

The individual in charge of the quality control or analytical group must understand his or her role and its importance to the company. A good quality manager can turn his group into one that can generate huge cost savings to the company if he or she does the job competently. The manger must also focus on how the group benefits the company by preventing problems, eliminating waste and contributing to more efficient operations. Troubleshooting and focusing on the negatives of "this may happen if ..." will not endear the manager or quality measurement group to the rest of the organization.

It is essential that all employees be given adequate training to not only do their job but understand why they are doing it. When they understand their tasks, they are in a position to make suggestions to improve the way a task is done. This is one of the principles of Total Quality Management, or TQM. In a food processing operation, education should include food hygiene, good manufacturing practices and the importance of documenting how, when and why work was done.

The personnel have a duty to respect and follow the approved protocols provided, and to accurately record measurement data and results. More on this subject when record keeping is discussed.

Important Protocols

One of the factors that kicked off the industrial revolution was the development of the assembly line and interchangeable parts. Identical units were produced, so manufacture and repair were made simpler. Similarly, standardization of methods and operating procedures is essential to good laboratory operations.

In a new facility, writing protocols and establishing a formal manual for laboratory staff to follow may be the most important task of the laboratory or quality operations manager (even more so than hiring people). One of the critical points involved in "standardizing procedures" is "record keeping," so these two issues will now become interwoven. The old adage, "Keep It Simple," should be followed whenever possible.

Of course, each of the tasks noted in Figure 2 (and there are more) involves not only the development of procedures for "how to do it," but also protocols for how to monitor that the procedure is being followed. Not an easy task, but a task that has been greatly simplified with the advent of computers in the laboratory. Blumenthal (2) describes how this tool has, can and may be used in laboratory management. There are many software programs available to the laboratory manager to make his or her task simpler. These include large and expensive LIMS (Laboratory Information Management Systems) and a wide range of sample log programs.

Figure 2

Among the protocols the laboratory manager is responsible for developing are the following:

- ❑ Sample Receipt.
- ❑ Work Progress.
- ❑ Analytical Methods.
- ❑ Equipment Usage.
- ❑ Laboratory Notebook.
- ❑ Procedures Update.
- ❑ New Systems Evaluation.
- ❑ Cleanup.
- ❑ Downtime Analysis.
- ❑ Materials Inventory
- ❑ Material Safety Data Sheets
- ❑ Statistical Methods.
- ❑ Validation.
- ❑ Sample Tracking.
- ❑ Materials Supply and Aging.
- ❑ Employee Education.
- ❑ Equipment Standardization.
- ❑ Forms Development.
- ❑ Regulatory Compliance.
- ❑ Materials Storage.
- ❑ Safety Systems.
- ❑ Staff Schedules.
- ❑ Disposal Techniques.
- ❑ Computer Software Training.
- ❑ First-aid Training.
- ❑ Records Management (audit trail).

We'll examine some of the procedures that need to be individually developed at each lab site. One crucial procedure often ignored is the development and maintenance of a sample acceptance log. Every sample that comes into a laboratory should be given a unique number and described, even an ordinary line sample for QC. A sample log book or computer log and printout is an invaluable tool to maintain this information. Headings that might be included in a sample logbook may be seen below:

Date, Sample No., Description, No. of Samples, Storage Location Entered By, Date Work Started/By Whom, Date Completed, Results (or location of results). These column headings are "fields" in a computerized database version of the log.

Included in the protocol for "logging in" will be instructions on how to label, store and maintain the sample until needed. Another field that may be added to written or computerized logs is Hours Expended. This field allows the manager to evaluate how efficiently employees complete tasks and provides him or her with a tool for time management. A computer log for samples may be kept in inexpensive PC software such as the GANTT Systems programs. If the laboratory works with samples that may be involved in litigation, such as in a testing laboratory, the staff must develop a procedure to track all their samples without prejudice. For legal reasons, there must always be a chain of possession or custody. If an attorney can later show that the laboratory "lost control" of a sample for even a short period, concerns regarding tampering or fraud could invalidate the results of sample testing.

Establishing Methods

Analytical procedures or methods is another area that must be established as part of the standard operating procedures. Many laboratories, including most testing laboratories, using Official and/or Recommended methods. These methods are published by organizations such as the Association of Official Analytical Chemists (A.O.A.C. - International), the American Oil Chemists' Society (A.O.C.S.), the American Association of Cereal Chemists (A.A.C.C.) and the American Public Health Association (A.P.H.A.). Methods are also published by a number of trade associations, including the Snack Food Association (S.F.A.). Procedures may also be developed in-house, be drawn from the technical literature or be supplied by manufacturers of equipment or testing materials.

Validation of new or revised methods and approval for use in lab operations is essential. Methods known to be carefully collaborated, such as A.O.A.C. procedures, are sometimes applied directly; however, suitability for a particular situation needs to be established. Tested and approved procedures and appropriate references must be indexed and filed in an operating manual in such a way as to assure that only the current approved procedure is used.

The lab staff (or the manager in many cases) rewrite these procedures to reflect the needs of their workers and for ease of use. By clearly delineating the materials required, adding step-by-step procedures for the method and writing in such a way as to assure that every user of the method will clearly know exactly what to do at each step without making any assumptions, procedures can become easier to use. An independent reading of the first draft can help strengthen written instructions. The final writeup must be validated by actual laboratory performance by a typical user of the procedure as written, without consultation with the writer.

Another area that is not emphasized often enough is equipment calibration. Each piece of equipment used in the laboratory for product quality or safety monitoring must be maintained, inspected and calibrated on a regular basis. Records showing when and by whom these protocols were carried out are essential. It is also important that the proper standards be used, whether they are weights, thermometers or known samples. The procedures to conduct these checks should be part of the operations manual, and it is recommended that they be posted or maintained in the vicinity of the instrument. Instruments should be labeled as to their calibration status and should not be used beyond their next scheduled calibration date.

Why is calibration important? Food safety, worker safety and product quality are three reasons. For example, let's look at temperature, a parameter that is easily, and may be continuously, monitored. Failure to maintain and calibrate a temperature recorder can have serious implications if temperature control is a critical factor. If it is discovered that a record has been reading in error, all measurement data since the previous calibration becomes suspect.

Maintaining laboratory notebooks or using standardized worksheet forms to collect data or record observations are other areas that require the development of standardized procedures. All too many people write down their results on whatever happens to be at hand and then later transfer it to a book or form. Data or observations should be made in laboratory notebooks or on approved forms only. It is recommended that notebooks use carbons so that a copy is immediately made that can be quickly filed offsite.

Forms may be produced on carbonless paper providing the same benefit. Many object to this kind of data collection. The most common excuse is, "People make mistakes and have to change entries." This is one excuse that simply doesn't carry any weight. If a mistake is made, the technician simply draws a single line through his or her error, inserts the correct value or comment and initials the change. If a record pertaining to food safety or any point a regulatory agency is entitled to review appears to have been altered without following the procedures noted, the company is asking for trouble. It is also suggested that notebooks or forms be reviewed and signed off on by a manager.

Vital Records

Data collection is another area that lends itself to computerized management and enhances the concept of good laboratory practices. Computerizing data collection allows managers to quickly and easily examine and evaluate data generated by their staff without going through notebooks or other files. Since a good data management program contains, or can be merged with, spreadsheet or statistical programs, data evaluation can be extremely simple. For example, if a donut manufacturer using measurements of free fatty acids, polar materials and surfactants as a means of monitoring frying oil quality continuously entered these values into a computerized data management system, it would be quite simple to compare changes in oil quality with product quality and stability as determined by the sensory group.

Another topic of discussion is materials supply and aging. All too frequently companies order materials only when they run out or find to their horror that a reagent or compound needed for a test has passed its "Use-By" date.

Developing a set of procedures for ordering, tagging, storing and using hardware, chemicals and reagents is an effective means to manage resources and reduce costs. The man-hours needed to do this will be paid for in higher efficiencies. Simply consider the costs of one "Rush Order." The supplier doesn't absorb these costs; they are passed on to you, the buyer. This, too, is another scenario where the computer can be an invaluable tool. Not only will a properly designed program allow a user to monitor actual stock on-hand, but also the capabilities exist for monitoring actual usage and declining shelf life. Any one of these can be keyed to automatically signal "Reorder."

For each of the protocols mentioned above, it should be obvious to the reader that record keeping is an integral part of each, and must, therefore, be an integral part of "Good Laboratory Practices." It is! Record keeping is vital to any food processor for a number of reasons. These reasons include legal requirements, food safety, food quality, protection in the event of recalls, process and product control, and a historical database for decision making. There are many others, also.

Legal requirements have already been alluded to. The importance of good record keeping may be seen by reading the book "Guide to Record Retention Requirements" (3). This volume summarizes where to find all records that are required by the Code of Federal Regulations. Records that must be kept by food processors may be found in several sections, including those dealing with food safety, environmental concerns and worker safety. Programs to address these issues and assure compliance should be included in any company's standard operating procedures.

Food safety is the primary responsibility of the food processor. Quality standards are something that must be set internally, but no matter what they are, the food produced must be safe, and there should be documentation to prove that so. This is the basis of the Hazard Analysis Critical Control Point (HACCP) system. Processors are not required to adopt HACCP but should consider it to protect themselves and the consumer. It is also a system that can provide unexpected economic benefits. If a company does have a HACCP system in place, the F.D.A may ask to examine those records because they pertain to food safety.

One point that all proponents of HACCP recommend be built into the system is a product tracking and recall program. This can be extremely valuable in the event of problems, but proper laboratory analyses and a well-designed HACCP system can be used to demonstrate to the F.D.A. that a recall is unnecessary. For example, several years ago, a major producer of baby food was threatened with a recall due to glass contamination. They were able to demonstrate, using in-house records and evaluation of the suspect glass, that there was no problem, and the F.D.A. canceled the recall.

Food quality and process/product control go together. The objective of the processor is to manufacture foods to set quality standards. Deviations from those standards can result in products being destroyed, sold for reduced costs, or, if sold as is, lost sales. Good laboratory practices include the development and implementation (plus calibration and training operators in the use) of tools to allow on line monitoring and control (4). The records generated during this process show that quality is being maintained, and that adjustments are being made, as needed, to maintain the target products.

Finally, records provide management with a history of how the lab and the plant are performing. Records can be used as part of the information base to upgrade systems, understand trends and streamline operations. And without records, it would be impossible to do any troubleshooting. Records are simply a vital part of a healthy and well-run company, and a cornerstone of any "Good Laboratory Practices" program.

REFERENCES

1. U.S. Food and Drug Administration (1989), "Good Laboratory Practice for nonclinical laboratory studies," *21 CFR, Part 58*, U.S. Government Printing Office, Washington, DC.
2. Blumenthal, M. M. (1992), "PCs in research and production laboratories," *Inform*, Vol. 3:5, 574-581.
3. Office of the Federal Register/National Archives and Record Administration, (1989), *Guide to Record Retention Requirements*, U. S. Government Printing Office, Washington, DC.
4. Stier, R.F. and M. M. Blumenthal, (1992), "The use of rapid methods for on-line monitoring," *Baking & Snack*, Vol. 14:5, 32-35.

Dairy, Food and Environmental Sanitation, Vol. 13, No. 5, Pages 276-277 (May 1993)

Food Irradiation, Food Irradiation Where Art Thou?

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Comparing food irradiation to a Shakespearean tragedy may not be as strange as it first seems. USDA finally published the regulations controlling the irradiation of poultry in September 1992 and people are wondering where the product is. Why isn't irradiated chicken available to the consumers? It seems the poultry processors and supermarkets are not interested in promoting or marketing irradiated poultry.

The industry's reaction to irradiated poultry is that when the customers ask for it they will provide it. I'm not aware of the customer ever asking for a new process or technology. They didn't ask for frozen foods, microwaveable foods, pasteurized milk, or even canned foods (except for Napoleon). In fact they resisted about every one of them. Thus, this is a rather weak argument for the processors and supermarkets lack of interest.

Their other argument - that they might lose business - on the surface seems stronger, but in reality is even weaker. They say they will lose business because the consumer doesn't want irradiated foods because they are not safe and their products and stores will be boycotted by the consumer activists.

If the consumers don't want irradiated foods then why did they buy 172 cases of irradiated strawberries to only 6 cases of the regular berries at a produce market in the Chicago area. Irradiated strawberries and other fruit sold well throughout the country this year. In the past, every time irradiated products have been offered to the public, they have been well accepted.

At a recent international conference on food irradiation in Orlando, Florida, Dr. Christine Bruhn (University of California, Davis) and Dr. Anna Resurrection (University of Georgia, Athens) reported on their research on consumer response to irradiated foods. Their results consistently showed the consumer's willingness to accept irradiated foods as well as the need for more information and education on the process. Consumers are not afraid of or against irradiated foods. The studies showed there was a small percent of consumers who probably would never accept irradiated foods, but then there is still a small percent of people who do not want pasteurized milk.

Food safety is one of the biggest concerns of consumers today and this is one of the major benefits of food irradiation. Irradiation destroys the pathogens and greatly reduces other microorganisms on poultry so that it is safer and has a longer shelf life. Salmonella in poultry has long been a public health concern, but Campylobacter jejuni is said to be the cause of most foodborne illnesses. It is present on poultry at a very high incidence level, much more so than Salmonella, even after the industry made processing changes to reduce microorganisms.

When an infant on formula, a high risk individual, gets Salmonellosis, most probably from contaminated kitchen counters or hands from chicken the family cooked, then you can realize the great need for irradiation. When 118 people out of 250 get sick and one dies at a wedding reception this year in Maryland in an incident that was traced back to Salmonella enteritidis in whole shell eggs it helps us realize the tragedy if irradiation does not become a commonly used technology.

Irradiation won't save all the 9,000 people that are said to die each year or even greatly reduce immediately the over six (6) million who become ill, but it will save some. Our poultry and eventually other foods will be safer.

The safety or irradiated foods is only an issue manufactured primarily by one activist group called Food & Water, Inc. The prior established so-called consumer groups have only been lightly critical of irradiation. The safety of irradiated foods has been proven over and over and is accepted by every responsible food and health regulatory and professional organization, including the World Health Organization.

The critics raise questions about the radiolytic products produced, but these are mostly the same as the thermolytic products produced by canning and cooking foods. These radiolytic products have been studied and found to be safe. The issues raised by critics are filled with maybes and what might happen. The critics have not provided facts or substance to support their issues. All the critical issues that have been raised have all been addressed by the FDA in approving the petition to allow irradiation of poultry and then by the USDA in establishing regulations for controlling the process there have been no new issues.

Speaking of no new issues - they say history repeats itself. The issues raised against irradiation are the same as those against pasteurized milk, and you can probably add microwave ovens and even frozen foods.

People in some 37 countries have eaten irradiated foods for years; the Japanese have eaten irradiated potatoes for more than 15 years. Laboratory animals used and analyzed in sophisticated research studies live off of irradiated diets providing continuous proof of their safety.

Reprinted from FAMFES (Florida Association of Milk, Food and Environmental Sanitarians) News, Winter 1992.

The threat of boycotts, etc., are equally hollow. The produce market in Chicago has yet to see its first protester and the market in Miami had 5 or 6 paid protesters for a day. The caravan of protesters and other threats made to the Miami market never materialized. The Food & Water, Inc. just does not have any in-depth public support.

It will be a tremendous tragedy if a new technology, which offers such definite benefits to society, is left to die and fades away. If the commercialization of irradiated poultry does not succeed with so many obvious advantages then there will be no food irradiation in our future! Food irradiation needs the help of everyone to show the poultry processors and the retailers that it is needed and wanted.

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The Case for Improving Milk Quality Regulations: Milk Somatic Cell Counts

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Introduction

As of July of 1993, all Grade A milk sold in the commercial marketplace will not be allowed to exceed a somatic cell count of 750,000 per milliliter of milk. This standard was adopted by the 1991 National Conference on Interstate Milk Shipments (NCIMS), and codified into regulation within the national Grade A Pasteurized Milk Ordinance (PMO) by the Food and Drug Administration (FDA).

This minor reduction of SCC from 1 million to 750,000, supported by the nation's dairy organizations, appears to have stirred the caldron of concern. The concern seems to say, "Can they do it?" and "What will be the impact?" The answers to these questions are a simple "You bet" and "Darn little." Analysis of milk quality regulation in the West may provide a window into the future performance of dairy farms and milk quality for other parts of the country and the nation as a whole, as they address the quality and economic concerns imbedded in this regulatory change.

The Purpose and Effects of Milk Quality Regulation

The somatic cell standard and the other new provisions of the PMO, do raise concerns regarding compliance, enforcement, penalties, and equity. A larger, more significant question needs to be raised about the role and effect of government regulations on milk quality and safety. Historically, the role of such regulations was to ensure that milk and dairy products do not compromise the health of the consuming public. FDA's mandate is not one of commercial market control. Its mission is to assure the safety of the nation's food supply and the safety and efficacy of drugs used in food production and human health management. Hence, the mission of the agency is legally constrained to seek and assure regulatory compliance. Compliance in terms of milk safety and the PMO means that all Grade A milk must meet a set of criteria. These criteria specify the conditions that milk is produced within, and objective measures of milk quality such as the SCC and various bacterial counts, including the Standard Plated Count (SPC), Laboratory Pasteurized Count (LPC), and the Coliform Count (CC). Research has shown that farm conditions (12), hygienic practices (8), and udder health (5,18) can affect the bacterial quality of milk. Attainment of milk quality and production compliance under the PMO can be achieved by just meeting or exceeding the minimum conditions and standards as specified under the PMO. States and local jurisdictions can impose higher standards. Failure to comply with the minimum standards of the PMO may result in demotion to B Grade status, and inability to move the milk or product across state lines. The milk may not be processed and sold into markets supported by federal milk orders or price supports.

The effect of the regulations and enforcement at the farm and processor level is understood by the industry. The message is clear; comply or else! Unfortunately, there is a second, and perhaps unanticipated, effect of a policy of this nature. With compliance as the goal at the farm level, we should not be distressed to find that regulatory **minimums** become the operational **maximums** for many producers. For example, if the highest quality milk and production practices receive an "A" grade, it is suggested that milk that just meets the compliance standards of the PMO gets a "D" grade or "barely passing."

Dairy professionals are frustrated by producers who fail to see the benefits in improving milk quality and mastitis control by striving for low bulk tank somatic cell counts. At the same time, we must acknowledge that the effect of the federal PMO SCC policy pushes many to do only what is needed to keep the milk salable and nothing more. The question then is, given the mandate of the FDA and the purpose of the PMO, can we expect anything more than compliance? The answer has to be a clear and loud NO!

Arguments that have successfully modified the PMO in the past have had to show a clear benefit for the safety of milk. The classic example is the pasteurization requirement. The cause-and-effect relationships of pathogens, disease, and pathogen removal by heat treatment of milk are beyond argument. In this post-modern era, simple cause-and-effect improvements in milk quality and safety will be few, if not non-existent. On the other hand, there is a rationale for milk quality regulations that take advantage of statistical associations. For example, our data from California clearly shows that as herd SCC is lowered there is a very significant reduction in specific milk pathogens and bacteria in general (5). The adoption of the 750,000 is movement to safer milk, and was supported by statistical arguments such as those revealed in the California work. The New York work demonstrates that mastitis control practices also tend to result in milk with lower overall bacteria content (8). Recent work by Ginn and Packer (1991) show good relationships between BTSCC below 500,000 and bacteria counts. This data further supports the improvement of the SCC standard.

Adapted from NMC Proceedings, February, 1992 and Dairy, Food and Environmental Sanitation, February 1993.

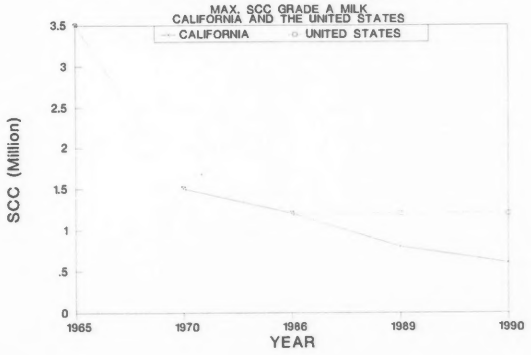
These relationships may provide the rationale for newer and refreshing approaches to milk quality and safety regulation. It is appropriate to ask of milk quality and safety regulations, "What is their role?" Furthermore, will they lead, or are they in the way? Are they in the way, by fostering the compliance mentality among producers and processors alike? If that is the case, perhaps it is time for the commercial sector to become leader in milk quality control and leave PMO to its basic role of preventing the classic food-borne disease problems.

The California Experience

The history of the SCC standard in California may be a window into the future for the country's dairy industry, and provide some light on the question of the effect of milk quality regulations on industry performance. In 1965, Grade A bulk-tank milk that contained more than 3.5 million cells per ml. was unsalable. The test used to screen tank milk was the California Mastitis Test (CMT). A score of two on the bulk-tank milk was reason to confirm the count microscopically and reject the milk accordingly (14). Reflect on that for a moment. Grade A milk was processed and sold with 3 million SCC. It is no wonder that centrifugal clarifiers were common. The processors had to remove the results of a pervasive herd mastitis problem; billions of pus cells. Not a pretty picture.

In 1970, the PMO was modified to limit the SCC standard to 1.5 million — a dramatic improvement —based on the argument that dairy products would be safer. Figure 1 depicts the SCC legal limits for California and the nation from 1965 to 1990. In 1986, the NCIMS recommended the SCC standard be further reduced to 1 million per milliliter of bulk tank milk. By this time, the use of SCC information for herd management (6, 22), cost saving mastitis control (23, 15, 13, 16), and improvement of milk quality (11, 25, 3) were well documented. Progressive farms and processors were adopting processes and programs to further reduce the SCC in farm milk (10,17).

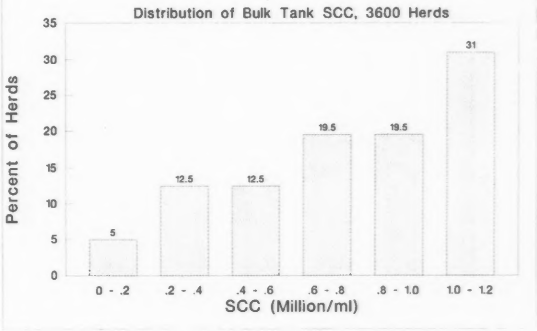
FIG. 1. RAW MILK SOMATIC CELL STANDARDS FROM 1965 TO 1990. UNITED STATES AND CALIFORNIA



In 1989 and 1990, California, in an almost predictable fashion, departed from the federal standards and, with industry support, adopted 800,000 and 600,000 SCC standards in those years, respectively. In both years, there was little concern or empathy for those farms that were unwilling to join the vast majority of the producers. The State Department of Food and Agriculture is not constrained by statute to limit milk quality regulations to only those that are justifiable in public health terms. The industry, with the state's assistance, used regulation to advance milk quality within the state. In so doing, industry supported regulation moved milk quality far ahead and the compliance mentality has become the exception among producers.

In retrospect, where did California go as a result of the combination of PMO policies and those adopted recently by the state? Figure 2 depicts the results of a tank milk survey conducted in 1963 on 3600 herds. Thirty-one percent of the herds had BTSCC over 1 million. Seventy percent of the farms would be in violation of today's SCC standards for the state. Only 18% of the herds had BTSCC of less than 400,000. In stark contrast, a similar survey conducted in 1989 to assess the potential impact of the lower SCC standards revealed the newer standards would have minimal effect (Figure 2). In that survey, 89% of the herds had BTSCC of 400,000 or less. Only 2.8% would be affected by the new regulations.

Fig 2. Distribution of SCC for California Herds 1963. Milk Somatic Cell Counts.



In 1986, producers received a message that BTSCC of greater than 1 million would evoke penalties. In California, it was rigidly enforced. In 1989, and again in 1990, the state continued the trend by reducing the SCC to 600,000. This stepwise downward trend sent a clear signal to the industry and the industry responded. Alternatively, and perhaps more simplistically, the regulatory minimums decreased and dairy managers responded in order to keep the farm in compliance. Or perhaps more realistically, once the trend for decreasing the BTSCC began and the benefits to Grade A producers became quite obvious, motivated producers and processors pushed change well ahead of regulatory policy.

Figure 4 depicts this stepwise trend that began in California in 1986. In one respect 1986 is 1990 for the balance of the country. The year 1993 will bring the first step increment and initiate a trend. Certainly, most producers will respond to the mandate and do that which is needed to comply. What will or should happen in 1994 and thereafter? The opportunity to continue the trend is at hand. Will the industry settle for another decade of compliance attitudes or become the advocates for making the next logical step — a step toward excellence in quality and away from mere compliance?

Fig 3. A Survey of California Herd Milk Somatic Cell Counts for 1989

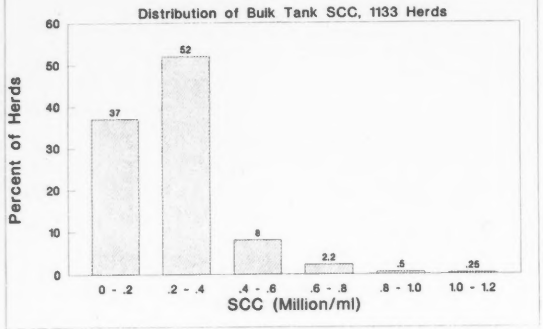


Fig 5. The Proportion of US Dairy Cows and Herds Participating in DHIA Somatic Cell Screening Programs, 1988.

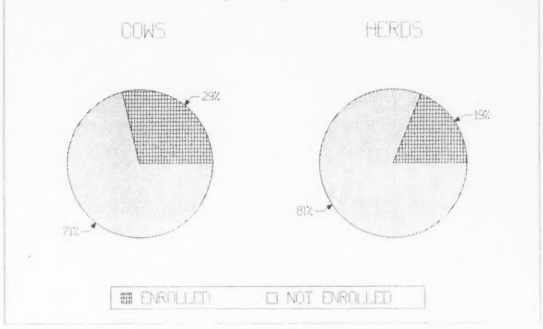
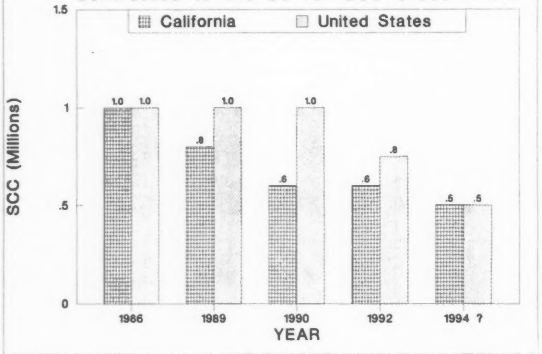


Fig 4. The SCC Standards for California Contrasted to the US for SCC Grade A Mil



The Problem Farm

Regardless of what is written or said, there will be at least one farm that is caught by surprise by the new BTSCC standards. Some would say, "Too bad, there was plenty of notice." It is a competitive world, and getting more so.

For the problem farm, there is ample opportunity for improvement if, and only if, management is willing to change behavior. The information on how and why to use herd and cow SCC information was recently reviewed by Reneau (1990), and provides analysis of the many monitors for mastitis control and milk quality improvement. Easy to understand publications, like the National Mastitis Council's *Current Concepts in Bovine Mastitis* (1978), provide the mechanics for mastitis control. Central to the effective control of BTSCC is knowledge of the SCC from the milk from all cows in the herd. A recent survey of DHIA and USDA information suggests a problem, in that only 19% of the herds and 29% of the cows in the country are enrolled in some type of DHIA cow somatic cell information. Figure 5. (5).

The herd in jeopardy of loosing its Grade A market, that does not have individual SCC information on all milk cows on regular basis, is at risk. At a minimum, the herd should seek veterinary assistance and have composite sample California Mastitis Test or Wisconsin Mastitis Test information on each cow. Alternatively, the herd may enroll in a DHIA SCC program and then seek professional assistance.

Armed with individual SCC information, a herd at risk of losing grade A status because the BTSCC exceeds 750,000 has a quick and fast tool to maintain or regain compliance. The tool is culling. By culling some of the highest SCC cows in the herd, significant and immediate improvements can be made in the bulk tank SCC.

A Culling and BTSCC Model

In order to demonstrate how significantly a few cows with high SCC can influence the BTSCC, a mathematical model was constructed for this analysis. A small herd of approximately 176 cows were distributed by SCC ranges corresponding to the common DHIA linear score categories, as shown on Table 1 (26). Daily milk weights, typical of a modern herd, were assigned for each group. The weights are not adjusted, they are simply for calculation for the group's contribution of Somatic cells to the bulk tank. The eight cows in the highest SCC group contribute 31.6% of the SCC in the BTSCC. There is little doubt that these animals are infected with mastitis pathogens (1) and most likely have been for months, if not years. The weighted average BTSCC for the herd is 865,000. In Table 2, the effect of culling seven of the highest problem cows and adding one heifer of low SCC is demonstrated. The BTSCC is reduced to 643,000 and the herd is now in compliance. Compliance has saved the day, but the farm is far from plugging the financial holes that mastitis punches in the farm milk tank. According to a 1989 USDA National Health Monitoring System report, the typi-

Table 1. Model depicting the somatic cell contribution from cows in a mastitits problem herd.

No. of cows	SCC Range (1000)	Mid-point	Linear Score	Av. Prod. lbs/day	Total SCC/day (million)	percent of herd scc/day
0	0-17	12.5	0	51	.00	.00
1	18-34	25	1	52	.57	.01
5	35-70	50	2	55	6.03	.15
27	71-140	100	3	59	69.84	1.79
55	141-282	200	4	61	294.17	7.54
27	283-565	400	5	59	279.35	7.16
28	566-1130	800	6	54	530.29	13.59
15	1131-2262	1600	7	55	578.69	14.83
12	2263-4525	3200	8	54	909.07	23.29
8	4526+	6400	9	55	1,234.53	31.63

Total: 178

Estimated milk per day (gal) 1196.860

Total SCC per day (mil) 3902.53

STSCC (per ml) (1000) 865

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cal California dairy looses $14,804 per year due to udder disease (19). The herd in Table 2 still has 56 cows that have high SCC and are seriously infected with some agent like *Strep ag.* or *Staph. aureus* and could easily continue to loose large sums of revenue and fall out of compliance with the SCC standard of the PMO. Alternatively, it could go on culling the worst of the SCC cows and suffer the consequences of culling for reasons other than "genetic" low production.

Table 2. Model depicting the affect of culling seven high CC cows, on bulk tank SCC.

No. of cows	SCC range (1000)	Mid-point	Linear Score	Av. Prod. lb/day	Total SCC/day million	Percent of herd scc/day
0	0-17	12.5	0	51	.00	.00
1	18-34	25	1	52	.57	.02
7	35-70	50	2	55	8.44	.30
27	71-140	100	3	59	69.84	2.47
55	141-282	200	4	61	294.17	10.41
27	283-565	400	5	59	279.35	9.89
28	566-1130	800	6	54	530.29	18.77
15	1131-2262	1600	7	55	578.69	20.49
12	2263-4525	3200	8	54	909.07	32.18
1	4526+	6400	9	55	154.32	5.46
Total 173						
Estimated milk per day (gal)				1164.884		
Total SCC per day (mil)					2824.72	
BTSCC (per mil) (1000)					643	

In contrast, the herd in Table 3 has implemented the common mastitis control strategies and reduced the size of the infected cow population to a point where 55% of the BTSCC is attributed to cows under 200,000. This herd is light years ahead of the PMO, is not concerned with compliance, is economically benefiting from the control of udder disease, and is the likely beneficiary of milk quality premiums.

Table 3. Distribution of cow SCC in herd with a low bulk tank SCC.

No. of cows	SCC Range (1000)	Mid-point	Linear Score	Av Prod. lb/day	Total SCC/day (million)	Percent of Herd SCC/day
2	0-17	12.5	0	51	.56	.06
3	18-34	25	1	52	1.71	.19
14	35-70	50	2	55	16.88	1.84
51	71-140	100	3	59	131.91	14.37
94	141-282	200	4	61	502.76	54.76
9	283-565	400	5	59	93.12	10.14
3	566-1130	800	6	54	56.82	6.19
1	1131-2262	1600	7	55	38.58	4.20
1	2263-4525	3200	8	54	75.76	8.25
0	4526+	6400	9	55	.00	.00
Total: 178						
Estimated Milk per day (gal)				1229.419		
Total Scc per day					918.09	
BTSCC (per ml) (1000)					198	

Self-fulling Prophecy and the Dairy Farm

The change to a 750,000 SCC standard should have very little impact of the dairy farms in this country. Yes, there are a number of farms that exceed that standard today. For those who wait for the BTSCC implementation date, by default or design, and then sing a tale of woe, too bad. Processors should set expectations for the new standard immediately. Furthermore, when the enforcement day comes, states are advised to enforce fully. Nothing is more confusing and arbitrary than to set a rule and fail to enforce it. The mixed message will be devastating, morally, politically, and economically.

There were many that resisted the 750,000 compromise that emerged from the NCIMS conference. They argued that the farmers of their states are not, and would not, be able to meet the new standard. Such rationale is just a little short of 100% pure nonsense. The dairy industry in these regions has a compliance mentality and, as such, the expectations set forth exact nothing more. To suggest there is something inherently unique about farms in the West and that their success is not repeatable elsewhere, is absurd as well. There are truly excellent farms in every region of the country. States with poor performance in milk quality are getting what they expect. State dairy regulators and other leaders are teachers. The expectations of teachers are shown to significantly affect the performance of students. Low expectations yield low performance and vice versa. The basis for the power of the self-fulling prophecy is well researched and documented (2) and taught in schools of business and education.

The Future

The case should and will be made at the next NCIMS conference to lower the BTSCC further to 500,000, as originally proposed by the National Mastitis Council and endorsed by the American Association of Bovine Practitioners. The question of human health justification will again be asked earnestly by the states and FDA. Others will argue the lack of clear evidence of public health benefits of further reducing the BTSCC as a means of protecting the mediocrity of their state.

The BTSCC standards trend started in 1970 should be continued through the 750,000 and onward to 500,000 in 1994. Further improvement in the BTSCC standards should continue, until such a time when the public heath concerns that existed when milk could be legally marketed from farms with a bulk tank SCC of 3 million, remain no longer. This will appear as a radical proposal, but consider the facts. Farms in the future will be vastly fewer in number, and much larger in herd size and far greater production per cow. Processors will be larger and will serve huge populations of consumers. The risk posed by a small percentage of high BTSCC herds in 1965 is vastly different for that same small percentage in the year 2000. Lastly, the concern for the public's health in 1965 moved the legal BTSCC to 1.5 million. The concern then, and now, is one of probabilities. Some argue that to lower the BTSCC standard to 500,000 offers no significant public health benefit. The same argument could have been offered in 1965, as the relationship is not one of cause and effect. What happens to the public health benefit when the BTSCC sandard was lowered from 1.5 million to 1 million, that does not occur when it is lowered from 1 million to .5 million? The argument is nonsense. Further reduction in the BTSCC will have about the same benefits. The resistance arises from prejudiced perception, geo-politics, and something other than logic.

Presently, there are serious regulatory, public health, and consumer concerns about the adulteration of milk and dairy products with animal drugs (9, 19). The case will be

made and data will support the argument that reducing the legal BTSCC from 1,000,000 to 750,000, and further to 500,000 will reduce the potential for animal drugs in the milk supply. Reducing the number of infected animals will reduce the quantity of drugs used to treat disease. A Midwest cooperative reports that fieldman visits to dairy farms regarding antibiotic adulterated milk declined as the BTSCC of the patrons declined (24). The observation that low BTSCC is a reflection of low cow SCC is correct. It is not correct to ascribe greater mastitis susceptibility to cows and herds with lower SCC (27).

Conclusion

The new Somatic Cell Count standard of 750,000 will not adversely affect the herds in the country. Rather, for those herds whose goal is compliance, the new standard will provide a new goal; one that is consistent with the market demands that are, and will be, placed on farm milk quality. In this respect, the federal standard is providing the beginning of a milk quality improvement trend that is and will be accelerated as commercial market forces replace the federal commodity system.

To provide continued leadership and to continue to ensure the safety and quality of milk, the industry and the FDA should support a further reduction in the BTSCC to 500,000, to be implemented in 1994. At that point, the US will be aligned with the other major milk producing countries of the western world.

To the question of regulations as blessings or curses, the answer lies in perception. For those who want to keep government out of the business and at the same time ask government to keep the playing field level for all players, the new standard is a curse. For those who believe the government's role is to stimulate innovation and competitiveness through health and safety programs, it is a blessing. As the dairy industry approaches world markets, greater accountability to consumers, and ever-increasing competition it ought to consider carefully its role and that of the government.

REFERENCES

1. Andrews, R.J. et. al. 1983. Relationship between individual cow somatic cell counts and the mastitis infection status of the udder. Australian J. Dairy Tech. June.
2. Arends, R.I., 1991. *Learning to Teach*. McGraw-Hill Inc. New York.
3. Barbano, D.M. et. al. 1987. Impact of mastitis on dairy product yield and quality. Proc. 28th Annual Meeting National Mastitis Council.
4. Bennett, R.H., J.K. Reneau, G.E. Shook. 1989. Udder health in the United States: report of the National Mastitis Council Milk Quality Monitoring Committee. Proc. 28th National Mastitis Council.
5. Bennett, Richard H. 1987. Milk quality and mastitis: the management connection. Proc. 26th Annual Meeting National Mastitis Council pp. 138-150.
6. Crandall, Bliss H. 1984. Understanding and using dairy herd somatic cell count information from DHIA herds. Proc. Regional Meeting National Mastitis Council. Long Beach, CA.
7. Galton, David M. 1985. Effects of premilking udder hygiene on environmental bacterial contamination, sediment, and iodine residue in milk. Bovine Proc. No. 17. pp 108-114.
8. General Accounting Office. 1990. Food safety and quality - FDA surveys not adequate to demonstrate safely of milk supply. Washington, DC.
9. Geyer, Jim. 1990. Premiums make a difference. Proc. of the 29th National Mastitis Council. pp. 14-22.
10. Gudding, Roar. 1982. Increased free fatty acid concentrations in mastitis milk. J. of Food Protection. Vol 45. No. 12. pp 1143-1144.
11. Hartley, J.C., et. al. 1968. Bacterial test results of grade-A raw milk samples as a measure of farm production conditions. J. Iowa Ag. Home Ec. Exp. Sta. Iowa State University.
12. Hueston, William D., Lawrence E. Heider. 1985. Use of individual cow somatic cell counts and bulk tank samples to monitor herd mastitis status. Bovine Proc. No. 17.
13. Jensen, L. 1989. Personal communication. California Department of Food and Agriculture.
14. Jones, G.M., et. al. 1984. Relationships between somatic cell counts and milk production. J. Dairy Sci. 67:1823-1831.
15. McDermott, M.P., H.N. Erb, and R.P. Natzke. 1982. Predictability by somatic cell counts related to prevalence of intramammary infection within herds. J. Dairy Sci. 65:1535-1539.
16. McGlochlin, M.L. 1988. California cooperative creamery's quality bonus program. Proc. 27th Annual Meeting National Mastitis Council pp. 80-86.
17. Morse, Pamela M. et. al. 1968. Investigation of factors contributing to the bacterial count of bulk tank milk. J. Dairy Sci., Vol. 51, No. 8.
18. National Animal Health Monitoring System. 1990. *California Report - Summary of Round 3 Dairy*. Fort Collins, CO.
19. National Research Council. 1989. *Alternative Agriculture*. National Academy Press. Washington, DC.
20. NMC. 1978. *Current Concepts of Bovine Mastitis*. The National Mastitis Council, Washington, DC.
21. Packard, Vernal S. and Roy E. Ginn. 1991. Interrelationships between select quality tests and levels of milk components. Dairy, Food and Env. San. Vol. 11, No. 10. pp 577-581.
22. Peters, R.R., J.E. Manspeaker, J.L. Majeskie. 1986. Interpreting and using DHI somatic cell counts. University of Maryland. Bulletin 310.
23. Raubertas, R.F., G.E. Shook. 1982. Relationship between lactation measures of somatic cell concentration and milk yield. J. of Dairy Sci. 65:419-425
24. Reneau, Jeffrey K. and Vernal S. Packard. 1990. Monitoring mastitis, milk quality and economic losses in dairy herds. Proc., Int. Symp. Bovine Mastitis.
25. Senyk, G.F., D.M. Barbano, W.F. Shipe. 1985. Proteolysis in milk associated with increasing somatic cell counts. J. Dairy Sci. 68:2189-2194.
26. Shook, George, Anne Saeman. 1983. The new DHI linear score for somatic cell count. Proc. 22nd Annual Meeting National Mastitis Council.
27. Timms, Leo. 1990. Can somatic cell counts get too low? Proc. of the 29th National Mastitis Council. pp.94-101.

Updates . . .

The 80th IAMFES Annual Meeting, August 1-4, 1993 at the Stouffer Waverly Hotel in Atlanta, Georgia provides IAMFES members the opportunity to attend and participate in the group meetings of their choice. The following is a schedule for the meetings of the IAMFES Committees, Task Forces and Professional Development Groups. These meetings, except those noted, are open to all Annual Meeting participants. IAMFES members are strongly encouraged to participate in these meetings.

SUNDAY, AUGUST 1

6:45 - 10:00 a.m. ..... Affiliate Council
10:00 - 11:00 a.m. ..... Dairy Quality and Safety (Farm Section)
10:00 - 11:00 a.m. ..... Audio Visual Library
10:00 - 11:00 a.m. ..... Baking Industry Sanitary Standards
10:00 - 11:00 a.m. ..... Past Presidents Advisory
10:00a.m.-5:00p.m. ..... Communicable Diseases Affecting Man
11:00 - 12:00 a.m. ..... Poultry Safety and Quality
11:00 - 12:00 a.m. ..... Dairy Quality and Safety (Plant Section)
11:00 - 12:00 a.m. ..... Foundation Fund
11:00 - 12:00 a.m. ..... Nominating
1:30 - 2:30 p.m. ..... Sanitary Procedures
1:30 - 3:30 p.m. ..... Seafood Safety and Quality
1:30 - 5:00 p.m. ..... Meat Safety and Quality
1:30 - 2:30 p.m. ..... Dairy, Food & Environmental Sanitation
1:30 - 3:30 p.m. ..... Applied Laboratory Methods
1:30 - 3:00 p.m. ..... Food Sanitation
2:30 - 3:30 p.m. ..... Environmental Issues in Food Safety
2:30 - 3:30 p.m. ..... Journal of Food Protection Management
3:00 - 5:00 p.m. ..... Food Safety Network
4:00 - 6:00 p.m. ..... Program Advisory

WEDNESDAY, AUGUST 4

12:00 - 4:00 p.m. ..... Program Advisory (members only)

News

Sigismondo De Tora Elected BISSC Chairman

Sigismondo De Tora, process development manager, Nabisco Biscuit Co., East Hanover, NJ, was elected chairman of the Baking Industry Sanitation Standards Committee (BISSC) during the organization's annual meeting February 26, 1993, Marriott Hotel, Chicago. De Tora replaces Frank Goley, vice president of engineering, Campbell Taggart, Inc., Dallas.

As a BISSC member, De Tora has served on the design handbook committee and the marketing and promotion committee. He has 14 years' experience in the baking industry with a background in process design and development and project management. His current responsibility with Nabisco is the implementation of new processes into existing bakeries. He is also a long time member of the American Institute of Chemical Engineers.

De Tora earned his master's degree from New York University and bachelor's degree at the University of Rhode Island.

Goley, who served two years as BISSC chairman, will remain on the board as vice chairman. He succeeds Bill Davis, executive vice president, sales & marketing, Stewart Systems, Inc., Plano, Texas.

An active member of the BISSC board since 1983, Goley has served as chairman of the Long Range Planning Committee. He also provided leadership as chairman of the American Society of Bakery Engineers (ASBE), member of the American Institute of Baking's (AIB) Ad Hoc Task Force Committee and American Bakers Association's (ABA) Energy Committee.

Goley's career in the baking industry began in 1959 as an architectural engineer for Campbell Taggart. In 1974, he was placed in charge of the engineering department.

Bonnie Sweetman continues as the association's secretary/treasurer. She has served in this capacity since the organization moved to Chicago in December 1985.

For more information, contact BISSC headquarters, 401 North Michigan Avenue, Chicago, IL 60611-4267; (312)644-6610.

BISSC was formed in 1949 to develop and publish voluntary sanitation standards for the design and construction of bakery equipment. The Office of Certification of BISSC was established in 1966 to promote greater recognition and use of bakery equipment conforming to the criteria of the standards. Under this self-certification program, individual equipment manufacturers may apply for BISSC registration and certify equipment which meets the requirements of the particular standard(s) for which they are seeking authorization. Once certification is approved, the equipment manufacturer may then display the BISSC symbol on the equipment certified within the program.

Evaluation of Certain Food Additives and Naturally Occurring Toxicants

Thirty-ninth Report of the Joint FAO/WHO Expert Committee on Food Additives

Technical Report Series, No. 828
1992 vi + 49 pages (available in English; French and Spanish editions in preparation)
ISBN 92 4 120828 7
Sw.fr. 9.-/US 8.10
In developing countries: Sw.fr. 6.30
Order no. I100828

This book presents the conclusions of an expert committee commissioned to evaluate the safety for human consumption of selected food additives and naturally occurring toxicants and to establish acceptable daily intakes for these substances. The committee also establishes specifications for the identity and purity of food additives in order to make certain that the materials subjected to toxicological testing are adequately defined and correspond to the products in commerce. Reports in this series, which has been issued since 1957, are used in the formulation of national food legislation intended to ensure the appropriate use of food additives and to protect consumers from hazardous contaminants, and by the Codex Alimentarius Commission in establishing international food standards. Reports in the series also give toxicology laboratories useful advice on the types of studies most relevant to the safety assessment of food additives.

The report, which has two main parts, considers the acceptable daily intakes for 25 food additives and 3 naturally occurring toxicants. The first part of the report addresses various methodological problems that arose during the evaluation of these substances. Topics discussed include the use of safety factors to derive acceptable daily intakes, the need for a flexible approach to the safety assessment of flavouring agents, and general principles for the evaluation of naturally occurring toxicants.

The second and most extensive part provides succinct summaries of the toxicological data examined and factors considered when evaluating each substance, identifying any potential hazards to consumer health, and allocating an acceptable daily intake. Substances considered include three emulsifiers, three enzyme preparations, five flavouring substances, three solvents, two thickening agents, six waxes, curcumin, furfural, and potassium bromate. Acceptable daily intakes were established or revised for a number of these substances.

The report also evaluates safety data on cyanogenic glycosides and on the closely related glycoalkaloids, solanine and chaconine, which are naturally occurring

toxicants. For cyanogenic glycosides, which are present in a number of tuberous starchy crops, nuts and fruit seeds, bamboo shoots, and certain species of beans, and which can release hydrogen cyanide, no safe level of intake could be estimated. The report notes, however, that traditional users of foods containing cyanogenic glycosides normally have a basic understanding of the treatment required to render them safe for consumption.

Though no safe level of intake could be determined for solanine and chaconine, which occur in potatoes and other tubers, the report concludes that normal glycoalkaloid levels found in tubers that have been properly grown and handled are of no concern. To support the continued safe use of potato tubers, the report recommends that those developing new cultivars, and others growing, harvesting, storing, processing, and consuming potatoes, should be aware of the possibility of inadvertently increasing the content of glycoalkaloids to potentially toxic levels. The report concludes with a table summarizing recommended daily intakes and listing changes in the status of specifications for substances considered by the committee.

Sales Agents for WHO Publications in the United States: Books (not subscriptions): WHO Publications Center USA, 49 Sheridan Avenue, Albany, NY 12210. Subscriptions: WHO, Distribution and Sales, 1211 Geneva 27, Switzerland. Publications also available from the United Nations Bookshop, NY, NY 10017 (retail only).

Silliker to Present Short Course in Chicago, Illinois

Silliker Laboratories Group, Inc., will offer a presentation of its newest and most popular short course, "Principles of FOOD Microbiology," in Chicago, IL, on July 7-9, 1993.

This 2-1/2 day course is designed for practicing food technologists responsible for the microbiological safety and quality of foods, and for those individuals whose job function requires a knowledge of these areas. The registration fee is $750.

Designed and coordinated by Dr. John H. Silliker, the course combines lecturers, discussions, and an informal evening session to provide a basic understanding of the factors that affect microbial growth in the safety and survival of food products. Special emphasis is placed upon the microbial ecology of foods, the influence of processing techniques on microflora, and the influence of these factors on the safety and quality of various foods.

A number of highly respected food industry professionals will service as lecturers for various presentations. They include Dr. John Silliker, founder of Silliker Laboratories, and Dr. Russell S. Flowers, president of Silliker Laboratories Group, Inc.

Founded in 1961, Silliker Laboratories provides chemical and microbiological analyses, technical consulting, research and educational services related to the safety, stability, and nutritional value of foods. Silliker Laboratories are located in Chicago Heights, IL; Columbus, OH; Garwood, NJ; Stone Mountain, GA; Sinking Spring, PA; Carson, CA; Fresno, CA; Hayward, CA; College Station, TX; Grand Prairie, TX; San Antonio, TX; and Mississauga, Canada. Silliker's corporate branch is located in Homewood, IL.

For additional information or to register for "Principles of FOOD Microbiology," contact Silliker's Education Department at (708)957-7878 or write, Attn: Education Department, Silliker Laboratories Group, 900 Maple Road, Homewood, IL.

New Laboratory Workshops from ATCC

American Type Culture Collection's (ATCC's) Laboratory Workshops Department has added two additional workshops to the 1993 schedule. The first is a new workshop on "Insect Cell Culture and Protein Expression with Baculovirus Vectors," scheduled for September 27-30, 1993. The second is a repeat offering of the "DNA Fingerprinting" workshop, scheduled for October 12-15, 1993. These programs include a mix of laboratory experiments and lectures with instruction provided by experts from outside the ATCC.

Detailed information is available from: ATCC Workshops Manager, 12301 Parklawn Drive, Rockville, MD 20852, USA; Telephone: (301)231-5566; FAX (301)770-1805.

Food and Environmental Hazards to Health

Foodborne Disease Outbreaks — A 10-Year Review (1983-1992) of California Data

The national surveillance of foodborne disease outbreaks began over half a century ago in the United States (1). Interest in the early years about milkborne diseases was followed by concern about diseases transmitted by other foods. Surveillance efforts through the years have provided new information about foodborne diseases and have led to the adoption of important public health regulatory measures which have significantly reduced foodborne illness. California's surveillance program utilizes the definition of the Centers for Disease Control and Prevention (CDC) for a foodborne disease outbreak: an incident in which two or more persons experience a similar illness after ingestion of a common food, and epidemiologic analysis implicates the food as the source of the illness. It should be noted that there are exceptions to this definition, such as one case of foodborne botulism or one case of chemical foodborne poisoning (2).

For the 10-year period 1983 through 1992, there were 324 foodborne disease outbreaks reported in California. These outbreaks resulted in 9,824 cases of illness and 44 deaths (40 due to *Listeria*, 3 to *Salmonella*, and 1 to *Brucella*). Among outbreaks in which the causative agent was determined, bacterial pathogens were responsible for the greatest number of outbreaks (83%) and cases (77%). Chemical agents caused 10% of outbreaks and 19% of cases; parasites caused 2% of outbreaks and <1% of cases; and viral agents caused 5% of outbreaks and 4% of cases. The specific etiologic agents that were identified are shown in the table.

CALIFORNIA DEPARTMENT OF HEALTH SERVICES - DIVISION OF COMMUNICABLE DISEASE CONTROL - OFFICE OF STATISTICS AND SURVEILLANCE
CALIFORNIA, SELECTED REPORTABLE DISEASES
WEEK 1 ENDING 01/09/1993

	CASES REPORTED FOR PERIOD			CASES REPORTED TO DATE		
DISEASE	1993	1992	1991	1993	1992	1991
AIDS /1	-	-	-	-	-	-
AMEBIASIS	26	10	13	26	10	13
ANTHRAX	-	-	-	-	-	-
BOTULISM:						
- FOODBORNE	-	-	-	-	-	-
- INFANT	-	-	2	-	-	2
- WOUND /2	-	-	-	-	-	-
BRUCELLOSIS	-	1	1	-	1	1
CAMPYLOBACTERIOSIS	105	84	92	105	84	92
CHANCROID	-	-	1	-	-	1
CHLAMYDIAL INFECTNS.	788	546	1071	788	546	1071
CHOLERA	-	-	-	-	-	-
COCCIDIOIDOMYCOSIS	542	12	1	542	12	1
CONJUNCT. NEWBORN	-	-	-	-	-	-
CRYPTOSPORIDIOSIS	8	5	1	8	5	1
CYSTICERCOSIS	2	1	4	2	1	4
DENGUE	-	-	-	-	-	-
DIARRHEA OF NEWBORN	-	-	-	-	-	-
DIPHTHERIA	-	-	-	-	-	-
ENCEPHALITIS:						
- ARBOVIRAL /3	-	-	-	-	-	-
- PRIMARY & OTHER	6	4	2	6	4	2
- POST-INFECTIOUS	1	-	-	1	-	-
ESCHERICHIA COLI /3	-	-	-	-	-	-
FOODBORNE ILLNESS:						
- OUTBREAKS	4	-	-	4	-	-
- CASES	83	-	2	83	-	2
GIARDIASIS	140	56	94	140	56	94
GONOCOCCAL INFECTNS.	497	958	694	497	958	694
GRANULOMA INGUINALE	-	-	-	-	-	-
HAEMOPHILUS INFLNZ.	4	2	20	4	2	20
HEPATITIS:						
- TYPE A	87	100	84	87	100	84
- TYPE B	67	41	64	67	41	64
- TYPE D	-	-	1	-	-	1
- NON-A / NON-B	20	4	9	20	4	9
- UNSPECIFIED	1	-	11	1	-	11
- HEP. B CARRIERS	197	144	88	197	144	88
KAWASAKI SYNDROME	7	-	1	7	-	1
LEGIONELLOSIS	4	-	-	4	-	-
LEPROSY	-	-	1	-	-	1
LEPTOSPIROSIS	-	-	-	-	-	-
LISTERIOSIS	3	2	4	3	2	4
LYME DISEASE	2	7	2	2	7	2
LYMPHOGRANULOMA VEN.	-	-	-	-	-	-
MALARIA	11	-	6	11	-	6

	CASES REPORTED FOR PERIOD			CASES REPORTED TO DATE		
DISEASE	1993	1992	1991	1993	1992	1991
MEASLES:						
TOTAL	1	-	21	1	-	21
- INDIGENOUS	1	-	21	1	-	21
- IMPORTED	-	-	-	-	-	0
MENINGITIS, VIRAL	35	12	8	35	12	8
MENINGOCOCCAL INF.	4	5	6	4	5	6
MUMPS	1	6	9	1	6	9
N G U	139	114	143	139	114	143
PERTUSSIS	4	2	3	4	2	3
P I D	19	18	26	19	18	26
PLAGUE	-	-	-	-	-	0
POLIOMYELITIS	-	-	-	-	-	0
PSITTACOSIS	-	-	-	-	-	0
Q FEVER	-	-	-	-	-	0
RABIES:						
- ANIMAL	-	2	3	-	2	3
- HUMAN	-	-	-	-	-	0
RELAPSING FEVER	-	-	-	-	-	0
REYE SYNDROME	-	-	-	-	-	0
RHEUMATIC FEVER	-	-	1	-	-	1
ROCKY MTN SPOT FVR	-	-	-	-	-	0
RUBELLA	2	1	-	2	1	0
RUBELLA, CONGENITAL	-	-	-	-	-	0
SALMONELLOSIS	103	95	56	103	95	56
SHIGELLOSIS						
TOTAL	95	43	41	95	43	41
- GROUP A	-	1	-	-	1	0
- GROUP B	27	28	10	27	28	10
- GROUP C	2	2	2	2	2	2
- GROUP D	50	10	21	50	10	21
- GRP UNSPECIFIED	16	2	8	16	2	8
SYPHILIS:						
TOTAL	-	-	208	-	-	208
- PRIMARY	-	-	40	-	-	40
- SECONDARY	-	-	22	-	-	22
- EARLY LATENT	-	-	77	-	-	77
- LATE & LATE LTN	-	-	65	-	-	65
- CONGENITAL	-	-	4	-	-	4
TETANUS	-	-	-	-	-	0
TOXIC SHOCK SYNDROME	-	-	1	-	-	1
TRICHINOSIS	-	-	-	-	-	0
TUBERCULOSIS	196	166	122	196	166	122
TULAREMIA	2	-	-	2	-	0
TYPHOID FEVER	8	2	-	8	2	0
TYPHUS FEVER	-	-	-	-	-	0
VIBRIO INFECTIONS	-	-	1	-	-	1
YELLOW FEVER	-	-	-	-	-	0

/1 Reported monthly only. See monthly summary.
/2 Reports prior to 1993 reflect Botulism, wound and unspecified.
/3 Not reportable prior to January, 1993.

The most deadly foodborne disease outbreak reported during the 10-year period was due to soft, Mexican-style cheeses contaminated with *Listeria monocytogenes* (195 cases and 40 deaths). Most of the cases occurred in the greater Los Angeles area in pregnant Hispanic women and/or their newborns. The largest foodborne illness outbreak due to a microbial agent occurred at a company picnic. There were 1,300 attendees and 320 reported illness. The implicated food was deep-pit barbecued beef that had not been cooked thoroughly or stored properly. *Bacillus subtilis* was isolated from the product. During the 10-year period, *Salmonella* was the most commonly reported cause of foodborne disease (35 outbreaks: 1,178 cases and 3 deaths). The most common *Salmonella* serotypes identified were *S. heidelberg* (4 outbreaks) and *S. enteritidis* (3 outbreaks).

The chemical toxins that resulted in the greatest number of foodborne illness outbreaks were of animal origin, especially marine origin. There were 5 outbreaks (49 cases) due to scombrotoxin and 1 outbreak (2 cases) due to ciguatoxin. Mushroom toxins were the cause of 1 outbreak (6 cases). Heavy metals (zinc and copper) were responsible for 3 outbreaks (51 cases). Insecticides and pesticides

FOODBORNE OUTBREAKS BY ETIOLOGICAL AGENT, CALIFORNIA, 1983 - 1992

ETIOLOGICAL AGENT	1983-1992 Totals	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
BACTERIAL											
B. cereus	6	3	-	-	-	1	-	-	-	2	-
Brucella	1	-	-	-	-	-	-	-	-	-	1
Campylobacter	1	-	-	1	-	-	-	-	-	-	-
C. perfringens	10	-	1	1	2	1	1	4	-	-	-
C. botulinum	24	3	3	4	5	1	0	1	4	1	2
E. coli	1	-	-	-	-	-	-	-	1	-	-
Listeria monocytogenes	1	-	-	1	-	-	-	-	-	-	-
Salmonella	35	5	3	7	4	5	-	3	4	2	2
Shigella	7	1	1	-	1	2	-	-	1	-	1
Staphylococcus	15	3	2	4	-	-	2	2	1	1	-
Streptococcus, Grp A	1	-	-	-	-	1	-	-	-	-	-
Vibrio Cholerae 01	1	-	-	-	-	-	-	-	-	-	1
Vibrio, NonCholera	2	1	-	-	-	1	-	-	-	-	-
Other bacterial	8	2	-	-	3	2	-	-	-	1	-
Subtotal	113	18	10	18	15	14	3	10	11	7	7
CHEMICAL											
Ciguatoxin	1	-	1	-	-	-	-	-	-	-	-
Heavy Metals	3	-	1	-	-	2	-	-	-	-	-
Mushrooms	1	-	-	-	-	-	-	-	1	-	-
Scombroid	5	1	1	-	2	-	-	-	-	-	1
Aldicarb	1	-	-	1	-	-	-	-	-	-	-
Other Chemical	3	-	-	-	1	1	1	-	-	-	-
Subtotal	14	1	3	1	3	3	1	-	1		1
PARASITIC											
Trichinella	3	-	1	1	-	1	-	-	-	-	-
Subtotal	3										
VIRAL											
Hepatitis A	6	2	-	1	-	-	-	-	2	1	-
Norwalk Virus	1	-	-	-	-	-	1	-	-	-	-
Other Viral	0	-	-	-	-	-	-	-	-	-	-
Subtotal	7	2	-	1	-	-	1	-	2	1	-
CONFIRMED TOTAL	137	21	14	21	18	18	5	10	14	8	8
UNKNOWN	187	13	17	27	18	16	11	24	26	22	13
TOTAL 1983 - 1992	324	34	31	48	36	34	16	34	40	30	21

were responsible for 3 outbreaks. Insecticide spray resulted in 3 cases of illness, and Endrin-contaminated taquitos caused seizure disorders in 5 individuals. The largest documented episode of foodborne pesticide poisoning in North American history occurred in July 1985 from Aldicarb-contaminated California watermelon (690 cases in California, alone), and there were estimated to be more than 1,000 additional cases in 7 other states and Canada. Three Kern County watermelon growers were indicted for intentional misapplication of Aldicarb on watermelons, a crop for which Aldicarb is not registered.

Parasites caused 3 foodborne illness outbreaks (22 cases), all due to trichinosis-contaminated pork products. Viruses were found to cause 7 outbreaks: hepatitis A was implicated in 6 outbreaks (166 cases) and Norwalk virus was documented in 1 outbreak (14 cases).

The most frequently reported vehicle for foodborne disease transmission was beef (11 outbreaks; 600 cases). Mexican food (mostly beans) was reported as the vehicle in 10 outbreaks (236 cases of illness). Chicken was reported as the vehicle of foodborne illness in 8 outbreaks (362 cases). Other reported vehicles included fin-fish (6 outbreaks, 150 cases), pork (4 outbreaks, 70 cases), and shellfish (3 outbreaks, 6 cases).

Food associated with an outbreak was reportedly mishandled in some manner in 204 outbreaks (62.4%). Improper storage or holding temperature was the most frequently reported means of mishandling (54%), followed by poor personal hygiene of food handlers (15%), food from unsafe sources (9%), contaminated equipment (8%), and inadequate cooking (4%). The above categories are identified and defined on CDC Form 52.13, "Investigation of Foodborne Outbreak."

Reported by: Emilio E. DeBess, D.V.M., M.P.V.M., Veterinary Public Health Section, Division of Communicable Disease Control, California Department of Health Services.

Editorial Note: The number of outbreaks reported is undoubtedly only a small fraction of the number that occur. The likelihood that an outbreak is reported depends on many factors: cases might not seek medical attention and, when they do, they might seek different health care providers; laboratory testing may not be done; and, when cases are identified, local health departments may not have the resources to investigate. The etiologic agent was not determined in 58% of reported outbreaks. Suspected viruses such as Norwalk-like agents are difficult to confirm.

Procedures for the investigation of foodborne disease outbreaks are detailed in a monograph published by the International Association of Milk, Food, and Environmental Sanitarians, Inc. (3). (To order, telephone (515) 276-3344). It is important to investigate suspected foodborne outbreaks quickly because memories fade, people scatter and the suspect foods may be discarded or, worse yet, consumed by others (4). When a commercial source of contaminated food is identified, it frequently requires a coordinated response by state agencies (DHS, DFA), federal agencies (FDA, USDA, CDC), and local agencies (environmental health, public health) to control and prevent illness.

The prompt reporting of suspected foodborne illness is essential to the identification and removal of contaminated food supplies. Even mere suspicion that a foodborne illness has occurred is reportable and should be notified promptly to the local health department.

REFERENCES

1. Centers for Disease Control. Foodborne disease outbreaks, 5-year summary, 1983-87. MMWR 1990; 39(SS-1):15-57.
2. Centers for Disease Control. Case definitions for public health surveillance. MMWR 1990; 39(RR-13):1-43.
3. Committee on Communicable Diseases Affecting Man, Food Subcommittee. Procedures to Investigate Foodborne Illness, 4th edition. Des Moines, IA: International Association of Milk, Food and Environmental Sanitarians, Inc. 1987.
4. Werner, SB. Food poisoning. In: Last JM, Wallace RB, editors. Maxcy-Rosenau-Last Public Health & Preventive Medicine, 13th Edition. Norwalk, CT: Appleton & Lange. 1992:193-201.

HAZCON-Based Total Quality Management

Packaging Systems for Chilled Foods

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Types of Food Packaging Atmospheres

There are three types of food packaging for chilled foods. They are: MAP (modified atmosphere packaging), vacuum packaging, and simple closure with no exclusion of air. (Flye, 1989)

MAP

Modified Atmosphere Packaging, or **MAP**, is replacing the air within the package with a gas or mixture of gases. Carbon dioxide and nitrogen, either alone or in combination, are introduced into the package. Some producers introduce a small quantity of oxygen back into the package, to allow the aerobic spoilage microorganisms to grow so that the food will spoil before it becomes hazardous. This does not always work, though; sometimes metabolic processes may be taking place in the food in the package, which will deplete the oxygen. Generally, producers want as low an oxygen concentration as possible within the package, typically less than 0.5 percent, in order to reduce the development of oxidative rancidity and the growth of the spoilage bacteria.

The air in a MAP package can be removed several ways. One is by **vacuumization**. A pump is used to pull the air out of the package before replacing it with the gas mixture. Another method is **purging**, which is simply flushing with a gas mixture, usually high in nitrogen, in order to expel the air. Typical gas mixtures begin with 20 percent CO_2 and 80 percent N_2. The CO_2 provides microbiological growth inhibition. The nitrogen acts as a non-reactive filler gas. The CO_2 tends to be absorbed in the food, and the package gas volume shrinks and the package collapses. The nitrogen prevents too much package collapse. The CO_2 concentration can be as high as 80 to 100 percent, but then, there can be side effects such as acid flavor development and some food off-coloring. Note that CO_2 extends shelf life when the product contains only low levels of microorganisms. High levels of microorganisms can overwhelm the gas effect. Properly used with very microbiologically "clean" ingredients, product shelf life can be doubled or tripled under ideal conditions.

Vacuum Packaging

Vacuum packaging utilizes a pump to pull air out of the package before it is sealed. Normally, this is done in a vacuum chamber. The air (20% O_2) is reduced to less than 0.5 percent by vacuumizing to 5mm mercury, which is the equivalent to 0.2 inches mercury. (Note that 760 mm mercury equals one atmosphere, and 29.921 inches mercury also equals one atmosphere, the standard atmosphere in which we live.)

Conventional Panning with No Special Air Exclusion

There are a series of conditions whereby food is put into standard foodservice containers such as 12"x20"x2.5" pans or bags without special air exclusion. These include:

1. Pumping food at above 160°F into a closing and casing the casing
2. Putting a solid muscle of meat in a bag and heat shrinking the bag around the meat
3. Putting food in a pan and covering the food with film.

In these situations, there will be air at the surface of the food. Depending on the surface volume exposed to the air at the time of closing, the food will oxidize at some rate and change flavor during storage. It is important to minimize the oxygen effect. If food is packaged hot with little air, it tends to minimize the oxygen problem because the higher the temperature, the less will be the food's ability to hold oxygen. If the food is put cold into a 12"x20"x2.5" pan, for example, with only a film over the top, the food may be oxidized and have off-flavors in 3 to 5 days.

Packaging Terms and Materials

The following are the terms used to describe packaging.

Films

Films are generally co-extruded. Most films are composed of several types of material combined in layers. The outer layer is the abuse layer. The inner, middle, layer should have good gas and moisture barrier properties to reduce flavor loss and the transmission of O_2 into the package, causing oxidative rancidity. The inside layer, next to the food, should have good sealing properties. It must seal the two films together. In a multi-layer film, all of these layers are put together at the same time as the film is manufactured (co-extruded). Generally, films are thin and have good optical properties. Some are heat shrinkable, so that if they are put in hot water or hot air, they will shrink to the shape of the product.

Rollstock Laminates

Rollstock laminates are multi-layer structures. Instead of being co-extruded, layers are made separately, and adhesives are used to "glue" the layers together. Both films and

laminates are available in rolls or flat sheets. Usually, these laminates are not heat shrinkable.

Bags and Pouches

Bags and pouches differ in the way they are made. **Bags** are made from co-extruded materials formed into a tube. The material is placed in the bag-making machine as a tube. Between each bag there is a seal. This can be a curved seal, straight seal, or whatever type of seal is needed, depending on the product. Not all bags have an end seal. Some bags have two-sided seals, depending upon what is needed. Generally, bags are shrinkable.

A **pouch** is usually made from a laminate and is usually not shrinkable. Pouches can be sealed on two or three sides, depending upon what is needed. It is difficult to distinguish the difference between bags and pouches just by looking at them.

Casings

Casings are important in chilled foods processes. They are made from laminates in the form of tubes. Casings are sold in forms that are open at both ends or are clipped with a metal clip at one end.

Packaging Properties Important for Chilled Foods

There are a number of properties that are important for chilled foods. The American Society for Testing Materials (ASTM) has documents describing the testing methods for packaging materials. The following is a list of properties about which suppliers should be able to furnish data.

Appearance: transparent or translucent
Forms available: preclipped casings
Widths
Lengths
Tensile strength: psi at 73°F kg/cm
Elongation: % at break at 73°F kg/cm
Ball burst: impact strength kg/cm
Tear initiation gm
Tear propagation
Modulus of elasticity: stiffness
Low temperature properties
Water vapor transmission: gm/100 sq. in. (or sq. cm), 24 hr. Oxygen vapor transmission: cc/sq. m.,24 hr.,at m.
Maximum use temperature
Minimum use temperature
Resistance to acids/alkali Resistance to grease/oil
Maximum storage temperature

Tensile strength is the amount of force that is needed to make the packaging material fail when it is pulled. Tensile strength in the range of 6,000 to 10,000 psi at 73°F is good. **Elongation** is tested along with tensile strength, and is the stretching capability of the packaging material before it fails. A typical value is 100 percent to 600 percent at break at 73°F. The **ball burst** test consists of allowing a weighted ball to drop through a package. It indicates how much impact is necessary to make the film break. A typical value is 50 cm/kg at 73°F (maximum scale reading). The **tear initiation and propagation** test indicates how easy it is to start a tear, and once a tear is present, how easy it is to make the tear bigger. A typical value for both initiation and propagation is "difficult". **Modulus of elasticity** is the force needed to change the size of the packaging material. It is often indicated by a term of stiffness. Stiffer bags are easier to open. Hence, stiffness is important when bags need to be filled rapidly. A lower modulus of elasticity indicates a softer, more pliable film. A lower-value film should be purchased if the film is to be used to wrap food. Typical value for a bag film is 20 to 30 psi at 73°F.

Barriers

The packaging must provide a **barrier** that will inhibit or slow down the transmission of a chemical or a permeant (gas or moisture) through an intact package. A good barrier maintains the package contents and does not allow matter from the outside to migrate through the packaging material and contaminate the contents. Classifications of degree of the barrier properties of a film at 1 square meter per 24 hours at 1 atmosphere and 73°F are:

Barrier — 5 to 100 cc O_2
High Barrier — 1 to 5 cc O_2
Very High Barrier — less than 1 cc O_2

Oxygen

Oxygen can chemically change food. It can alter its color. It can cause rancidity and thus, change its flavor. It is also required for growth of many spoilage microorganisms. Generally, producers of chilled food want the lowest possible concentration of oxygen in the package. Oxygen transmission is considered to be the number of cubic centimeters of oxygen that move through a square meter of film in 24 hours at 73°F at 1 atmosphere of pressure. A range of 2 to 40 accounts for the differences in thickness of casings. Anything below 100 cc is a moderate oxygen barrier. Most of the pouches that are sold to do *sous vide* are less than 100 cc at 1 atmosphere. It is possible to get packaging films that provide very low transmission rates. Note that the ASTM oxygen transmission test is done at 73°F; transmission rates decline at lower temperatures. At 40°F, the transmission rates can be 20 percent of those at 73°F. Hence, actual oxygen transmission rates for products will be much lower when the food is stored refrigerated.

Water Vapor

Water vapor is critical. If the product being packaged is a moist product, the moistness must be maintained. If the product being packaged is dry, it must be kept dry. It is important to make sure that the packaging provides a good water vapor barrier. Water vapor transmission should be less than 0.5 gram water when the ASTM test is done at 100°F, 100 percent relative humidity. This test is based on how much water moves through 100 square inches (or 1 square meter) of film in 24 hours.

Flavor Volatiles

Flavor volatiles can be lost from food products. Any of the organic chemicals that comprise the flavor of food can move through an intact package wall. Some packaging materials provide good oxygen barriers but allow flavor and aroma volatiles to move through it. Transmission of gases

always goes from areas of highest to lowest concentration. Part of the shelf life study of the product should be its sensory evaluation in order to detect any loss of the volatile flavor components. Packaging material used for chilled food must maintain the food's flavor and aroma.

Abuse Resistance

Abuse resistance is very important. A product with bones should be packaged in packaging material that resists bone punctures. Greasy products require packaging materials that are grease resistant. Sometimes greasy products will attack the seals. Some laminate structures will delaminate or actually separate if they are not grease resistant. Acidic products (e.g., products with a lot of vinegar in the sauce) require acid-resistant packaging material. **Nylon** is one of the most abuse-resistant materials.

Functional Temperature

Functional temperature range is a facet of abuse resistance. It is important to know the hot fill temperature being used (180°F, 185°F, or 190°F) and the storage temperature of the product (chilled or frozen) when considering the type of packaging material needed. Also, if the packaged product is to be reheated, will it be reheated in the packaging material in simmering water or at a full, rolling boil? Good film can withstand 208°F for 4 hours minimum. These temperature variables make a difference in choosing the proper packaging materials, because of the diverse temperature tolerance qualities of different materials.

Closures

Closures are important to consider. Producers of chilled food need to know which type of closures are most suitable for their products, and should discuss this with their packaging suppliers. Types of closures include: clipped packages and packaging materials; bags that are heat sealed at one end at the factory production end; and packaging material or bags that must be heat sealed in the production of products. **Hermetic seals** are important so that no air is allowed to enter the packages. Note that if metal clips are used, they are potential hard foreign object hazards and could get into food, both during production and when customers are using the bags. Each metal closure must be controlled.

Cost

All of the properties previously listed influence cost. For example polyethylene bags are inexpensive but are a poor choice of packaging material for chilled food. Chilled food will not be protected by polyethylene bags; food cannot be reheated in them, and sealing problems may occur.

Storing Film and Packaging

Plastic film and packaging are moderately sensitive to storage conditions. Professional food processors keep packaging in special temperature- and humidity-controlled rooms. As a rule, film should be kept at 60°F, 50 percent humidity. If film is left open and uncovered, surface microbiological contamination can occur. Whether in storage or in use, plastic bags and pouches must be protected from accidental contamination such as splashed mop water.

Checking and Sealing

A critical part of using plastic packaging is checking for seal failure after the food is packaged. With pumped product in a casing that is not sealed under vacuum, the only way to verify that the seal is sufficient is to inspect the wire staple to find out if it is properly formed, has tightly gathered the packaging, and has not pricked a hole in the casing. If there is a burr on the clip, or if the clip is not aligned correctly, it can cut the outside of the casing. Holes can also occur along the body and shoulder of the casing. When there is a problem, it is important to be able to accurately describe the problem and then, get the film supplier to help solve the problem.

With vacuum pouches, there are two common checks for proper sealing. The first is to visually determine that the seals are flat, there is no entrapped food in the seal, and there are no "tunnels" caused by wrinkles in the seal. The second check is to put the package in water in a container under vacuum. If there is a seal failure, bubbles coming from the package will be present. In the case of vacuumized roasts, if there is a leak, when the roast is put into hot water for 15 seconds before being loaded into the cook tank, the air in the package will expand the package. The roast can then be repackaged.

Film Characteristics

Some Current Commercial Films

Below is a listing, **Film Characteristics**, of some of the common films being used by the industry in chilled food systems, and their performance characteristics (C&K Manufacturing and Sales Co.) (Cryovac) (KAPAK Corporation).

FILM CHARACTERISTICS

Item	Use	Thickness (inches)	Oxygen Transmission (1)	Water Vapor Transmission (2)	Source
Barrier I	Kettle-pumped food, cook-in-bag	0.0045	30	4	Hynes, C&K
NT-I	Tank cook-in-bag food (no shrink)	0.003	2,900	5	Hynes, C&K
B series barrier bags (3)	Tank cook-in-bag food (hot water shrinkable)	0.0024	3 to 6	7.75 40°F	Dufault, Cryovac
CN 600 Super L casings	Tank cook-in-bag food (hot water shrinkable)	0.0024	20	7.75	Dufault, Cryovac
C300	Kettle-pumped food, cook-in-bag	0.0045	2 to 40	7.75	Dufault, Cryovac
P 640 (3)	*Sous vide*, cook-in-pouch	0.0027	62	7.75	Dufault, Cryovac
#5 Scotch Pak	*Sous vide*, boil-in-the-bag pouch	0.0020	108	6.2	Teich, KAPAK
#48 Scotch Pak	*Sous vide*, boil-in-the-bag pouch	0.0045	77	3.1	Teich, KAPAK
100 NS2 nylon	*Sous vide*, boil-in-the-bag pouch	0.00325	7.75	3.1	Teich, KAPAK

(1) cc/m^2 24 hours, 1 atmosphere at 73°F, 0% relative humidity.
(2) $grams/m^2$ 24 hours at 100°F, 100% relative humidity.
(3) Sold only to USDA-inspected facilities by Cryovac.

REFERENCES:

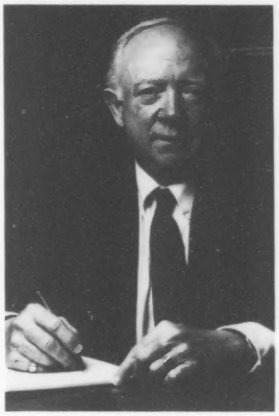
ASTM. 1916 Race Street. Philadelphia, PA 19103-1187. (215) 299-5400.

Dufault, R. 1992. Cryovac. Duncan, SC 29334. (800) 845-7551.

Flye, S. (Cryovac Division, W.R. Grace & Co.). August 23, 1989. As part of "Preparing chilled and vacuum packed (*sous vide*) foods safely and profitably" seminar. Presented at Hennepin Technical College in cooperation with the Hospitality Institute of Technology and Management. St. Paul, MN.

Hynes, K. 1992 C&K Manufacturing & Sales Co., P.O. Box 40308, Bay Village, OH 44140-0308. (800) 821-7795.

Teich, J. 1992. KAPAK Corporation, 5305 Parkdale Drive, Minneapolis, MN 55416. (612) 541-0730.



A Mind Set

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A Checklist - Part 4 Continued

This article concludes the equipment portion of the 4 part checklist for the sanitary food plant of today.

13. Are off-the-floor racks provided for equipment parts dismantled for cleaning or changeover?

Food processing equipment that is not designed for clean in place (CIP) cleaning and sanitizing procedures must be cleaned using accepted clean out of place (COP) procedures. COP procedures often require dismantling of multifaceted equipment such as grinders, mixers, choppers, and fillers. Many small parts are removed and should not be laid on the floor for cleaning. If COP tanks or washers are not available, then stainless steel baskets, platforms or racks should be provided for rinsing, foaming, final rinse and sanitizing of the parts. These racks or platforms are as important to equipment layout and lists as the pieces of equipment that require cleaning.

14. Are all pipe and tubing joints free of fractures?

Weld fractures in pipe joints make ideal breeding places for microbes. In addition to weakening the joint, a fracture provides hangup points for product particles and are extremely difficult to clean by CIP procedures. The old adage "you cannot sanitize a dirty surface" is very true. Food particles hung up in weld fractures protect any microbes caught inside from detergent cleaning and from the germicidal effects of sanitizing agents.

Welding stainless steel pipes together should be done using an inert gas weld procedure. Usually argon gas is used, and then the welds are examined internally using a boroscope. This ensures that there are no cracks, fractures, or catch points to snag food products or protect areas from being exposed to detergents or sanitizers. The use of experienced stainless steel welders when joining and welding stainless steel pipes or tubing can minimize the possibility of bad welds.

15. Do you have adequate screens, metal detectors or magnetic traps installed to detect foreign materials in your product flow?

Screens, metal detectors, magnetic traps, x-ray units, entoleters, color sorters and other such equipment are all essential in providing protection from contaminants. However, it must be remembered that this equipment must also be cleanable and of sanitary design to prevent it from becoming a source of contamination. Screens, for example, can be difficult to clean if they cannot be easily dismantled for cleaning or replacement. Metal wire screens must be inspected periodically for broken wires that can contaminate the product with metal pieces.

Many metals used in food processing equipment today are non-magnetic and will not be picked up by a magnet. Therefore, use of metal detectors is becoming more and more popular and necessary. This equipment is a small price to pay for reducing the potential of metal-contaminated product from reaching the consumer. In-line metal detectors should be designed and constructed so any of their product contact surfaces are smooth, without cracks or crevices with accessibility for cleaning and sanitizing. Some of the early designs involved have a number of flat surfaces, sharp corners, Allen head fasteners and are non water-tight, making them unsanitary as they cannot be sprayed with detergent and rinsed with hot water and sanitizer.

16. Do you fluidize, air convey, or pump to eliminate hard-to-clean screw conveyers, bucket elevators, etc.?

Screw conveyers are often necessary to certain process and product transfer systems. However, they are extremely hard to clean and sanitize. Screw conveyers should be designed so the bearings are on the outside. A drop bottom cleanout door should be located at the very end of the conveyer shaft at the low point to facilitate cleanout. The lid on the screw conveyer should be easily lifted or removed to make it easy to clean with high pressure sprays and foamers. Some screws are equipped with CIP systems, but these must be monitored closely for effectiveness.

Bucket elevators are one of the more unsanitary pieces of equipment in a food processing line. Product collects in the boot, product hangs up in the buckets and they can become major attractants for insects. Some bucket elevators on the market today have attempted design with sanitation in mind, but it is very difficult to design one that can be easily cleaned

and kept clean. Therefore, the recommendation is not to use a bucket elevator if at all possible. There are some very good pneumatic systems on the market today, both dense phase or dilute phase, that are fast, efficient and designed to be easily cleanable. Filtered air can and should be used with any air conveying systems. Using correctly designed lines with long sweeps for changing direction minimizes build up points, simplifies cleaning and prevents product contamination by microbial buildup.

17. Do you avoid the use of open grating for catwalks and stairs over processing areas or equipment?

Open grating is only acceptable when the walkway is over an area where there are no product contact surfaces, process lines or product. There are too many instances in food processing plants where open catwalks are above open product or processes. Walkways over these areas should be solid with four inch sidewalls that are coved with a one inch radius or, if separate pieces, are continuously welded to the flat portion. Checker plate should be used in wet areas for safety, and smooth plate can be used in dry areas if desired. Under no circumstances should open walks be allowed over open product, allowing contaminates from the bottom of a person's shoes or boots to fall off and to the product below. The same applies to stairways leading to other floors or to platforms. Stairs should be constructed with tubular members or flat plate and not C channel. The tubular members should be closed on both ends and the stair treads should be welded to the members. Risers may or may not be necessary, but if they are, they should be continuously welded to the side members and to the treads. If open treads are used, they should not be over processing equipment, product, or product contact surfaces.

Ladders constructed from vertical tubes with the steps welded to them are acceptable from a sanitary design basis. Ladders may require roughened treads for safety reasons and that is permissible. When it comes to a conflict between safety and sanitary design, safety usually prevails. Equipment can always be hand scrubbed. Stairs and ladders should have a single point of contact to the floor to facilitate cleaning. Some stair designs are suspended from the ceiling so the stair structure does not touch the floor.

18. Is equipment constructed so operators do not have to place their hands in the product zone or stream to adjust the equipment during operation?

On the surface, this appears to be a safety question. It actually doubles as a safety and a sanitation question. If equipment, especially that with open product contact surfaces, is designed so the operators have to lean over it to adjust it or place their hands in the product stream, then the design is not considered sanitary. Equipment of this type is not recommended for use in a food processing plant. Equipment with this defect already in place should be considered for replacement as soon as possible.

This is the final section of the expanded checklist. The list has four sections and next month's issue will carry the entire checklist with all the questions listed for each section.

Department of Agriculture

Food and Nutrition Service

National School Lunch Program and School Breakfast Program: Nutrient Standard Menu Planning Demonstration Project

Agency: Food and Nutrition Service, USDA.

Action: Notice.

Summary: This notice announces the Department's intention to authorize selected school food authorities to participate in an expanded demonstration project under the National School Lunch and School Breakfast Programs to test an alternate menu planning system based on the analysis of nutrients. The results of this project will enable the Department to determine the viability of this approach as an alternative to the traditional meal patterns and to identify the technical assistance that the Department will need to provide, as well as the resources the school food authorities must have, in order to implement a nutrient standard rather than the food-based meal patterns. It is the Department's intention that the nutritional integrity of the program be maintained through adherence to the Recommended Dietary Allowances and the Dietary Guidelines for Americans.

Dates: Applications to participate in this demonstration project must be submitted on or before October 1, 1993. The Department will conclude its selection of school food authorities to participate in the demonstration project by April 1, 1994.

Supplementary Information: This action is not a rule as defined by the Regulatory Flexibility Act (5 U.S.C. 601-612) and thus is exempt from the provisions of the Act. In accordance with the Paperwork Reduction Act of 1980 (44 U.S.C. 3507), no new recordkeeping or reporting requirements have been included that are subject to approval from the Office of Management and Budget.

These programs are listed in the Catalog of Federal Domestic Assistance under No. 10.553 and No. 10.555 and are subject to the provisions of Executive Order 12372, which requires intergovernmental consultation with State and local officials. (See 7 CFR part 3015, subpart V, and the final rule related notice published at 48 FR 29114, June 24, 1983).

Background

As indicated in 7 CFR 210.10(b), the intent of the meal pattern for the National School Lunch Program (NSLP) has been to provide a nutritious, well-balanced meal that will, when averaged over a period of time, approximate one-third of the National Academy of Sciences' Recommended Dietary Allowances (RDAs) for key nutrients and calories for children of each age/grade group. The regulation setting forth the required meal pattern for the School Breakfast Program (SBP), 7 CFR 220.8, does not have a specific dietary goal, but the Department has informally set as a goal that breakfast should provide approximately one-fourth of the RDA for key nutrients and calories when averaged over a period of time.

In recent years, concerns about the nutritional content of school meals have emerged. While there is evidence from survey research that the NSLP provides a nutrient dense meal and provides significant amounts of protein and micronutrients, there are also concerns that the fat and sodium levels of the program are higher than desirable. The concerns raised about the program reflect the view that the diets of Americans, in general, contain excessive amounts of fat, cholesterol and sodium. As a first step in dealing with these concerns, the Human Nutrition Information Service, on behalf of the Department and in conjunction with the Department of Health and Human Services, issued the third edition of "Dietary Guidelines for Americans" on May 14, 1990. The Dietary Guidelines, originally published in 1980, are required to be updated at five year intervals by section 301 of Public Law No. 101-445, the National Nutrition Monitoring and Related Research Act of 1990. The latest edition of the Dietary Guidelines has established a goal that no more than 30 percent of calories consumed should be from fat (not more than ten percent of which should be from saturated fat). The Dietary Guidelines also recommended moderating intakes of sodium and sugar. The Department is committed to implementing the nutritional criteria of the new Guidelines in the school lunch and breakfast programs.

The Department also recognizes that it may be necessary to revise the current meal patterns to implement the Dietary Guidelines in schools. To this end, the Department expects, in a separate rule making, to solicit comments to assist in the development of revised meals patterns for the NSLP and SBP.

Nutrient Standard Menu Planning Demonstration

The Department will test an alternative method of menu planning for ensuring the nutritional quality of school meals — Nutrient Standard Menu Planning (NSMP). This method would require school meals served during a week to meet the goal of one-third of the RDA for lunch and one-fourth of the RDA for breakfast, for that period, as well as meeting the goal from the Dietary Guidelines that no more than 30 percent of total calories come from fat. Pursuant to the Department's authority in 7 CFR 210.10(i) and 220.8(e) to waive the requirements concerning adherence to required meal patterns, it would no longer be necessary for demonstration project schools to comply with the component and quantity requirements of 7 CFR 210.10 and 220.8. Instead, food services would have the flexibility to plan meals and

analyze the nutrient content of all foods to be served in those meals. However, milk must continue to be offered during all meal services. Adjustments would be made to individual menus as needed to ensure that, on average, the RDA and Dietary Guidelines goals as stated above are maintained.

Currently, the Department is monitoring a pilot test of NSMP conducted by the State of California Department of Education. Based on the State of California's experience with a few schools, the Department believes that NSMP may offer some potential in meeting the nutritional goals of the school lunch and breakfast programs.

The California pilot furnishes some indication that NSMP provides more flexibility in meal planning than the food grouping approach, that meals provide nutrients in amounts at least comparable to those in the current meal patterns, and that food costs may be no higher than under the current meal patterns.

Based on these preliminary results, the Department considers that NSMP may provide a significant tool for implementing the Dietary Guidelines in schools and for improving menu planning in general. Therefore, the Department intends to test NSMP on an expanded scale.

Solicitation of Proposals

The Department is issuing this notice to solicit requests from school food authorities (SFAs) wishing to participate in this demonstration project. The Department envisions this demonstration as a three-year test and anticipates admitting approximately 35 SFAs in the first year. To ensure as broad a base as possible, the Department intends that the pool of selectees will be diverse in terms of size, geographic location and food service practices. However, the principal criteria for selection will be demonstrated nutritional expertise and computer capability sufficient to operate the necessary software. Sites which do not currently have access to nutritional expertise or computer capabilities may participate provided they demonstrate that these capabilities will be acquired. Participation in both the NLSP and the SBP will not be a necessary requisite for SFAs seeking to participate in the demonstration project.

The National Nutrient Database for Child Nutrition Programs

The Department recognizes that implementation of NSMP is dependent upon the SFA's ability to analyze and manipulate nutrition data on a vast array of foods. While many nutrient databases are currently available, few of these are specific to the Child Nutrition Programs, and they do not contain the types of foods, descriptions, weights and measurements used in these programs. Therefore, the Department is developing a centralized nutrient database which will include processed and prepared foods used in school food services as well as the school food service recipes. It is the Department's intent that this database will be regularly maintained and updated to ensure that the information is accurate and current. The Department expects to have a working prototype of the National Nutrient Database for Child Nutrition Programs (NNDCNP) completed by January 1994. The Department will then make this database available to participating SFAs and computer software companies to use in developing programs to conduct nutrient analysis. The NNDCNP must be incorporated into the software that is utilized by demonstration project SFAs.

Submission of Requests

SFAs wishing to participate in this demonstration project should request an information packet and application by contacting Robert Eadie, Branch Chief, Policy and Program Development Branch, Child Nutrition Division, 3101 Park Center Drive, 10th Floor, Alexandria, VA 22303, (703)305-2618. This packet will include information on computer requirements, policy guidance, and instructions for completing and submitting an application. The information packet will include the criteria the Department will rely upon in its evaluation of applications. Final applications shall be submitted in writing not later than October 1, 1993. The Department will select SFAs by April 1, 1994 and will work these sites to implement the project during the fall/winter of School Year 1994/1995.

Subsequent Solicitations

As noted above, the Department envisions this demonstration project as a three-year test ending in June 1997. Therefore, SFAs not initially selected may wish to apply for inclusion in School Years 1995/1996 and 1996/1997. The Department intends to issue notices soliciting additional proposals for these school years in the Spring of 1994 and the Spring of 1995, respectively.

Dated: March 29, 1993.

Andrew P. Hornsby, Jr.,

Acting Administrator.

(FR Doc. 93-7684 Filed 4-1-93; 8:45 am)

Industry Products

New Field Test Kits from HNU Systems

HNU Systems, Inc., introduces its new low-cost Field Test Kits (EC63) for environmental methods. Applications for the EC63 include: ammonia in wastewater, fluoride and lead in drinking water, chloride in water, nitrate in soil, and ammonium in rivers and streams.

The EC63 is designed to make field analyses fast and easy. Users place the sensor directly in the sample and the instrument will read direct concentrations from 0.1 to 200 ppm. No further adjustment is necessary. The meter is precalibrated, so that only a simple one-point calibration is required on site. The EC63 allows users to quickly obtain accurate data in the field; thereby eliminating sample degradation during transport and/or storage.

The complete kit comes in a rugged carrying case and includes: pre-calibrated direct readout instrument, sensor, calibration standard, internal filling solution, reagent, graduated sample tubes, waste jar, tube stand, wash bottle, spare battery, and a note pad.

HNU Systems, Inc. manufactures and supports the widest range of environmental monitoring instrumentation available. HNU also manufactures x-ray fluorescence analyzers, microanalysis systems, and sensitive balances for scientific gas blending and other ultraprecise weighing. Our quality management system has been certified to the prestigious IS0 9002 standard--by which world-class companies are measured. HNU has offices in the USA, Canada, England, Germany, and Finland, with distributors the world over.

HNU Systems, Inc. - Newton, MA

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New Recyclable 10 Kilogram Package Provides Convenient Opening

Now ten kilogram packages of Difco dehydrated culture media and ingredients are packaged in new plastic buckets which feature easy to open covers. The buckets offer the convenience of opening without special tools or a hammer. Additionally, a tamper evidence indicator provides assurance that the product has not been opened.

These recyclable polyethylene pails contain the appropriate recycle symbols to meet worldwide standards.

These new packages of Difco Culture Media and ingredients are available now through leading laboratory distributors.

Difco Laboratories - Detroit, MI

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Dependable, comprehensive, and economical regasketing services for plate heat exchangers

Multiple immersion cleaning and conditioning of plates is just one part of the exacting WCR ten-step regasketing process. Gasket performance often depends on superior regasketing technology. The WCR ten-step regasketing process, assures extended service life, even in the most difficult applications.

WCR regasketing services are more economical and reliable than comparable services offered by plate heat exchanger manufacturers. WCR regasketing is also more dependable than in-plant, do-it-yourself regasketing.

Regasketed and reconditioned plates are usually on their way back to the processor within two weeks of receipt. To reduce downtime to just a few hours, evaluate the WCR exchange program.

WCR - Dayton, OH

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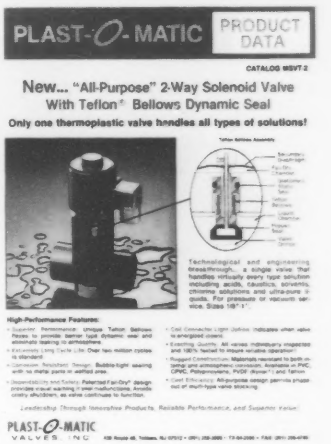
PLAST-O-MATIC PRODUCT DATA

CATALOG MSVT-2

New... "All-Purpose" 2-Way Solenoid Valve
With Teflon® Bellows Dynamic Seal

Only one thermoplastic valve handles all types of solutions!

Technological and engineering breakthrough... a single valve that handles virtually every type solution including acids, caustics, solvents, chlorine solutions and ultra-pure liquids. For pressure or vacuum service. Sizes 1/4"-1".

High-Performance Features:

- Superior Performance: Unique Teflon Bellows Flexes to provide barrier type dynamic seal and eliminates leaking to atmosphere.
- Extremely Long Cycle Life: Over two million cycles is standard.
- Corrosion Resistant Design: Bubble-tight sealing with no metal parts in wetted area.
- Dependability and Safety: Patented Fail-Dry® design provides visual warning of seal malfunctions. Avoids costly shutdown, as valve continues to function.
- Cost Conscious Light Indicator: Indicates when valve is energized (open).
- Exacting Quality: All valves individually inspected and 100% tested to insure reliable operation.
- Rugged Construction: Materials resistant to both internal and atmospheric corrosion. Available in PVC, CPVC, Polypropylene, PVDF (Kynar®) and Teflon.
- Cost Efficiency: All-purpose design permits purchase of multi-type valve stocking.

Leadership Through Innovative Products, Reliable Performance, and Superior Value!

PLAST-O-MATIC VALVES, INC.

Catalog Features One Solenoid Valve for all Type Solutions

Plast-O-Matic Valves, Inc. announces publication of Catalog MSVT featuring their new all-purpose Teflon® Bellows solenoid valves for use with corrosive and ultra-pure liquids.

The two-color literature describes and illustrates this unique thermoplastic valve which can be used with virtually every type solution including acids, caustics, solvents, chlorine solutions as well as ultra-pure liquids.

The catalog includes a cutaway illustration of the innovative Teflon bellows which flexes to provide a barrier type dynamic seal and eliminates leaks to the atmosphere. Since the bellows is not subject to chemical attack, exceptional performance results and 2 million cycle-life is normal for the vave.

Also described in the new literature is the patented Plast-O-Matic, Fail-Dry® safety design feature which provides visual warning of any seal failure while allowing the valve and system to continue operating and avoiding a costly shut down.

Additional information is provided on the 1/4" - 1" size valves including body materials of PVC, CPVC, Polypropylene, and PVDF (Kynar®), as well as specifications, dimensions, and pressure ratings.

Plast-O-Matic Valves, Inc. - Totowa, NJ

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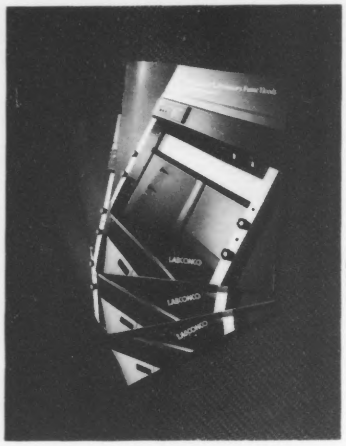

Labconco Introduces New Protector® Laboratory Fume Hoods and Accessories Catalog

Labconco Corporation, Kansas City, Missouri, introduces a new catalog detailing the full line of Protector® Laboratory Fume Hoods and Accessories.

This 96-page, full color catalog includes cutaway illustrations of key features and benefits, specifications, dimensional data and accessory information.

The catalog begins with an overview defining air flow designs, model selection considerations and safety and energy saving options. Protector Fiberglass Hoods, Protector Specialty Hoods and other Labconco hoods are thoroughly covered in the sections that follow. Accessories including base cabinets and stands, word surfaces and fixtures complete the offering.

Labconco Corporation - Kansas City, MO

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Versatile Lockouts Prevent Valve Tampering

A less expensive alternative to specially fabricated valve locking handles, Hayward all-plastic valve lockouts accommodate a wide range of Hayward ball and butterfly valves.

These corrosion resistant lockouts are made of impact resistant, highly visible orange polypropylene. They completely enclose the handle of the valve, preventing unauthorized tampering with the valve setting. One, two or three standard padlocks can be used to secure the lockout in the closed position.

Highly versatile, the two available sizes of the new lockouts accommodate Hayward ball valves from 3 inches to 6 inches and gear operated butterfly valves from 3 inches through 8 inches. They are now available from authorized Hayward distributors worldwide.

Hayward Industrial Products, Inc. - Elizabeth, NJ

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Actuated Valves

All sanitary Ball Valves offered by Fluid Transfer, Division of Lee Industries, Inc., can be "air-actuated" for use in areas where space is limited or inaccessible for manual operation. This automated Fluid-Flow line was developed particularly for rigid, corrosion-resistant, highly-sanitary applications in the food, cosmetic, pharmaceutical, beverage, and chemical industries. Standard, fully-encapsulating seals provide the maximum reduction in product entrapment, while standard Full-Flow ports eliminate product flow restrictions.

Vane-type or rack-and-pinion actuators allow for easy on/off operations, when connected to Fluid-Flow, flush bottom, two-way and three-way sanitary Ball Valves. When connected to Fluid-Flow's three-way in-line Ball Valves, the 180° actuator offers two directions of flow as well as an off position. These can also be operated from remote switch panels.

All Fluid-Flow, air-actuated ball valves feature Type 316 stainless steel construction with Mica-Filled Teflon seals, in sizes from 1/2" to 4". The simple, yet durable design of Fluid-Flow valves allows for fast breakdown and easy cleanup or maintenance, without any special tools. Pretested at 4 PSIG and high pressures (300 PSIG), the valves are USDA accepted and good for most vacuum operations. Maximum working temperature is 450°F for most valves. A variety of connections are available to fit your needs.

Fluid Transfer, Div. of Lee Industries, Inc. - Philipsburg, PA

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PYMS-200X Pyrolysis Mass Spectrometer

Curie-point pyrolysis is a well-established technique for analyzing small quantities of material in a highly reproducible way. The PYMS-200X automated pyrolysis mass spectrometer uses small foils in glass tubes as sample holders. The foils are an ideal shape for holding solids, suspension or solutions.

The system is entirely automated for up to 150 samples under the control of a 486 compatible PC. Data may be analyzed by the on board multivariate statistics program giving prineipal components, discriminant function, dendrograms, etc.

This instrument has applications in microbial strain characterization, forensic identification, flavor authentication, organic geochemistry and many more areas requiring rapid discrimination and classification.

Vestec Corporation - Houston, TX

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Supply Corporation offers "Sanitizing Mat"

The Supply Corporation is pleased to offer the "Sanitizing Mat" -- a sanitizing foot bath to keep areas free from disease, contamination, and germs.

This heavy-duty black rubber mat is 24" x 32" x 7/8" and its retaining walls allow it to hold up to five quarts of sanitizing solution. As you walk across the mat, small rubber fingers scrape the dirt from the soles of your shoes. At the same time, these fingers bend to allow your shoe soles to be coated with a germ-killing sanitizer.

The "Sanitizing Mat" is designed for use in dairies, food processing plants, laboratories, and anywhere that complete sanitation is essential.

The Supply Corporation - Lake Geneva, WI

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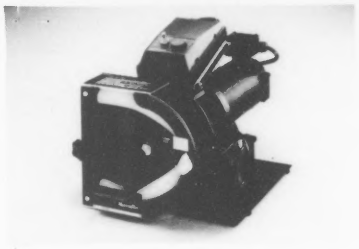

New Masterflex® Batch/ Transfer Tubing Pumps Move up to 45 LPM (12 GPM), Speed Tubing Changeover

New Masterflex® Batch/Transfer (B/T) tubing pumps from Barnant Company move viscous, shear-sensitive or abrasive fluids at flow rates up to 45 lpm (12 gpm), with max. pressure of 1.4 bar (20 psig) and suction lift up to 8.8 m (29 ft.) H_2O.

Fixed-, variable- and reversible-flow drives combine with Barnant's new Rapid-Load™ easy-opening pump head for fast tubing changes (no tools needed). Tubing occlusion is knob-adjustable, and B/T tubing is offered in four sizes and five materials to cover a wide variety of applications.

Variable-speed B/T integrated pump/drive systems provide built-in motor speed control up to 350 rpm. The full-featured B/T integrated system highlights a detachable controller and 10-foot control cable, with motor and controller washdown--protected for fast cleanup. B/T Rapid-Load pump heads are offered separately with 22.5 cm (9") dia. V-belt pulley, or fitted for coupling to NEMA Type 56C or ISO 71 (European) motors.

Built for continuous industrial applications, B/T System pump heads feature frames of stainless steel, carbon steel or Delrin®, plus aluminum occlusion ring and rotor with corrosion-resistant Nylatron® rollers. A smoked-grey polycarbonate pump head faceplate offers visibility as well as operator safety.

Barnant Company - Barrington, IL

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New Water Quality Monitoring Catalog Features System With Rapid-Pulse Dissolved Oxygen Technology

A new YSI Water quality monitoring catalog features two multiparameter systems — the YSI 6000 Environmental Monitoring System and the Grant/YSI 3800 Water Quality Logging System.

The YSI 6000 helps monitor and assess water quality in lakes, rivers, wetlands, estuaries and coastal waters. Its Rapid-Pulse dissolved oxygen measurement needs no stirring, responds quickly, is easy to calibrate in air, and reduces passive fouling.

The YSI 6000 also measures conductivity, salinity, temperature, resistivity, ORP, depth and total dissolved solids. It will function unattended for weeks in as little as a few inches of water or as deep as 500 feet, and data will be secure in the non-volatile memory.

The Grant/YSI 3800 Water Quality Logging System monitors surface water, wastewater effluent and groundwater with a self-stirring oxygen probe.

With a waterproof sonde this system measures dissolved oxygen, salinity, temperature, conductivity, pH, depth, turbidity and ammonia. The user programs it to record readings by site or to log data at intervals for unattended monitoring. Later, data can be downloaded to a PC or printer.

YSI Incorporated - Yellow Springs, OH

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Delco's Avenger Series of Pressure Washers Punish Dirt, Grease & Grime

Delco's AVENGER Series is a complete line of stationary LP and natural gas fired systems to tackle the toughest industrial tasks. When you need a quick and efficient cleaning system in your maintenance program, you need the Avenger.

As standard equipment, all of Delco's Avengers are equipped with dual belt driven triplex ceramic plunger pumps with low-water shut-off, 4.5 minute system shut down protection, electronic ignitor gas valves with 24 volt electrical step down control all built into a compact space-saving design.

Delco's Avenger Series of pressure washers offer a range of 1,000 to 3,000 psi with a temperature rise to 140°. Adding to performance and long life is a stainless steel float tank that eliminates carbon steel deterioration which causes the contamination of fuel tanks found on competitive units.

Other features found on Delco's Avenger Series include: an hour meter; a trigger gun control; a 12" draft diverter; an easy access pump and motor; a 50' wire braid, high pressure hose; a protective shroud belt guard/control panel; and an optional wheel kit.

Clarke Industries, Inc. -
St. Louis, MO

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New Product Brochure Now Available from Microfluidics Corporation

Microfluidics Corporation, a leading supplier of equipment for the processing and micromixing of liquid systems, has developed a new, informative brochure. The eight page booklet is now available free of charge.

The colorfully redesigned brochure outlines the pneumatic and electric-hydraulic product line of the Company and its 29 worldwide distributors. A brief history of Microfluidics and a description of the technology and operating principle introduce the catalog. Free sample testing, free demonstrations and a technical support hotline are a few of the customer benefits outlined in the literature.

A summary of machine specifications is included, as well as applications of the equipment. This portion of the brochure is divided into 5 industry categories (chemical, biotechnology, cosmetic, food and beverage, and pharmaceutical industries) and highlights a variety of processing solutions.

Microfluidics Corporation -
Newton, MA

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Synopsis of Papers for the 80th Annual Meeting

The following are abstracts of papers to be presented at the 80th Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, Inc., to be held in Atlanta, Georgia, August 1-4, 1993.

INFLUENCE OF AFLATOXIN AND NUTRIENT CONCENTRATION ON THE DEGRADATIVE ABILITY OF *FLAVOBACTERIUM AURANTIACUM*, J.E. Line*, Ph.D. candidate and R.E. Brackett, Food Safety and Quality Enhancement Laboratory, University of Georgia, Department of Food Science and Technology, Griffin, GA 30223-1797

Flavobacterium aurantiacum has been demonstrated to degrade ^{14}C-labeled aflatoxin B_1 (^{14}C-B_1) in phosphate buffer. This study was conducted to determine the effect of aflatoxin B_1 (AFB_1) concentration and presence of nutrients (tryptic soy broth) on the ability of *F. aurantiacum* to degrade AFB_1. Radiolabeled AFB_1 was used to trace metabolism. Following incubation with ^{14}C-B_1, the total cell pellet, chloroform-and-water-soluble fractions of supernatant fluid, and CO_2 were analyzed for radioactivity. Ultraviolet absorption maxima of non-radiolabeled samples were measured using a scanning spectrophotometer to determine the spectra of AFB_1 degradation products. Presence of non-radiolabeled AFB_1 (3 µg/ml) reduced the degradation of ^{14}C-B_1. Evolved $^{14}CO_2$ decreased by almost 50% when non-radiolabeled AFB_1 was also present. In addition, added nutrients increased AFB_1 degradation. The appearance of an ultraviolet absorption maximum at 404 nm with the concurrent disappearance of the AFB_1 absorption maximum at 363 nm was noted in water-soluble fractions after exposure to *Flavobacterium*. Control samples containing no cells showed no change in the AFB_1 absorption spectrum. These data confirm earlier studies reporting the ability of *F. aurantiacum* to degrade AFB_1 to water-soluble products and suggests additional energy may enhance degradation.

DETERMINATION OF CYTOSOLIC AFLATOXIN B_1-DEGRADING ACTIVITY OF *FLAVOBACTERIUM AURANTIACUM*, R. K. Phebus*, Assistant Professor of Food Science, and F.A. Draughon, Kansas State University, Call Hall, Manhattan, KS 66506-1600

Aflatoxin contamination of agricultural commodities poses a safety risk to humans and livestock. Live cells of *Flavobacterium aurantiacum* (*Exiguobacterium aurantiacum*) have been shown to irreversibly remove aflatoxins from broth and certain foods. Removal of aflatoxin B_1 by cellular fractions was investigated. A late log phase culture of *F. aurantiacum* was centrifuged and the cell-free extract tested for aflatoxin-degrading ability. After 60 h incubation at 30°C, HPLC analysis indicated only 16% of the initial aflatoxin B_1 had been removed (2.0 µg/ml initial concentration). The cell pellet was separated into a cytosolic and a membrane fraction by sonication and ultracentrifugation. At an initial aflatoxin level of 5.0 µg/ml, these fractions removed 99 and 27% of the toxin, respectively, during 48 h at 30° C. The cytosol fraction of *F. aurantiacum* may be a valuable source of a constitutive enzyme which degrades aflatoxin.

LEVEL OF *CAMPYLOBACTER* SPP. ON BROILER FARMS AND AFTER CHICKEN TRANSPORT, Ma. Rocelle Clavero*, N.J. Stern, J.S. Bailey, N.A. Cox, and M.C. Robach, Department of Food Science and Technology, University of Georgia, Athens, GA 30602

Levels of *Campylobacter* spp. colonization in ceca and on carcasses of chickens at broiler farms and after transport to a processing facility were determined. Twenty chickens obtained from each of 10 broiler farms were collected from houses containing 6 to 7 week-old birds. Ten chickens were killed at the farm while the other ten were transported in coops to a holding facility and killed after 16-18 h of holding time. Levels of *Campylobacter* spp. were assessed by washing the carcasses in phosphate buffered saline (PBS, pH 7.2) and cecal contents were also enumerated. On the farm, the mean cecal count was $\log_{10}$ 5.44 CFU *Campylobacter* spp./g, and after transport the mean was $\log_{10}$ 6.15 CFU. The mean level of *Campylobacter* spp. on chicken carcasses before transport was $\log_{10}$ 4.58 CFU/carcass and after transport was $\log_{10}$ 7.05 CFU/carcass. These increases in levels of *Campylobacter* spp. suggests that transport is a likely contributing factor to the high numbers and prevalence of *Campylobacter* spp. in and on chickens.

INFLUENCE OF SEASON AND STORAGE ON *CAMPYLOBACTER* SPP. CONTAMINATING BROILER CARCASSES, Norman J. Stern, Ph.D., Microbiologist, USDA, ARS, Russell Research Center, P. O. Box 5677, Athens, GA 30613

The frequency and levels of *Campylobacter* spp. associated with broiler chicken carcasses were monitored quarterly, over one year. At three-month intervals, we obtained 50 carcasses from a local processing plant, which had been in continuous operation for at least 12 hours. At each sample interval we monitored 10 carcasses initially and again after 1,3,7, and 10 days of 4°C storage in zippered plastic bags. Both enrichment culture and enumeration on selective media were employed. We observed our lowest initial rate of detection in spring and the highest rate in summer and fall. The levels detected ranged from non-detectable to 600,000 CFU per carcass. Detection of *Campylobacter* spp. was lowest after 10 days of 4°C storage. Cooler months of the year in northeast Georgia corresponded with a reduction in presence and levels of *Campylobacter* spp. associated with broiler carcasses. These reductions could be related to a seasonally diminished presence in source of the organism for the chickens. Detection of the organism was reduced with time under refrigerated storage.

IAMFES

Preliminary Program

80th Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, Inc.

In Cooperation with the Georgia Association of Food and Environmental Sanitarians

Stouffer Waverly Hotel, Atlanta, Georgia
August 1-4, 1993

SUNDAY EVENING, AUGUST 1

OPENING SESSION

7:00 **Welcome to the 80th Annual Meeting** - M. DOYLE, President of IAMFES and R. BRACKETT and J. FRANK, Co-Chairpersons of the Local Arrangements Committee

7:15 **Introduction of the Ivan Parkin Lecture** - H. BENGSCH, President-Elect of IAMFES

7:20 **"The Challenge of Epidemiology in Food Protection"** - M. POTTER, Assistant Director for Bacterial and Mycotic Diseases at the Centers for Disease Control, National Center for Infectious Disease, Atlanta, GA.

The Ivan Parkin Lecture is sponsored by the IAMFES Foundation Fund and is supported by the Sustaining Members.

8:00 **Cheese and Wine Reception** - Held in the Exhibit Hall. An opportunity to greet old friends, make new ones and view the excellent technical displays.

MONDAY MORNING, AUGUST 2

***LISTERIA MONOCYTOGENES*: CURRENT ISSUES AND CONCERNS SYMPOSIUM**
Sponsored by the International Life Sciences Institute
Convener: G. EVANCHO

8:10 ***Listeria monocytogenes*: State of the Science** - J. ROCOURT, Institut Pasteur, Paris, France

8:30 **Industry Perspectives on *Listeria monocytogenes* in Foods: Raw Meat and Poultry** - J. MARSDEN, American Meat Institute, Washington, DC

8:50 **Industry Perspectives on *Listeria monocytogenes* in Foods: Manufacturing and Processing** - D. BERNARD, National Food Processors Association, Washington, DC

9:10 **Industry Perspectives on *Listeria monocytogenes* in Foods: Retail Distribution** - C. ADAMS, Grocery Manufacturers of America, Washington, DC

9:30 **Regulatory Concerns of the U. S. Department of Agriculture** - A. MCNAMARA, U.S. Department of Agriculture, Washington, DC

9:50 **Regulatory Concerns of the U. S. Food and Drug Aministration** - J. MADDEN, U. S. Food and Drug Administration, Washington, DC

10:10 Break

10:30 **Epidemiology of Listeriosis in the United States** - A. SCHUCHAT, Centers for Disease Control and Prevention, Atlanta, GA

10:50 **European Perspectives on *Listeria monocytogenes*** - P. TEUFEL, BGA Institute for Veterinary Medicine, Berlin, Germany

11:10 **Status of *Listeria monocytogenes* in the Canadian Food Industry** - A. LAMMERDING, Agriculture Canada, Guelph, Ontario, Canada

11:30 ***Listeria monocytogenes* and Food: the UK Approach** - D. ROBERTS, Public Health Laboratory Service, London, UK

11:50 **Australian Perspectives on *Listeria monocytogenes*** - M. EYLES, CSIRO Food Research Laboratory, North Ryde, New South Wales, Australia

TECHNICAL SESSION
ANALYTICAL METHODS
Co-Conveners: R. NICKELSON and N. STERN

8:30 **The value of a DNA probe - HGMF procedure to detect *Shigella*/enteroinvasive *E. coli* and VTEC in food** - E. TODD, J. MacKenzie and C. Munro, Health and Welfare Canada, Ottawa, Ontario, Canada

8:45 **Development of a simple Reverse Transcriptase-Poly-**

merase Chain Reaction method for the Detection of Enteric Viruses in Oysters - L. JAYKUS, R. DeLeon and M. Sobsey, University of North Carolina, Chapel Hill, NC

9:00 **Automated ELISA detection of *Listeria* from Meat and Poultry Products using the VIDAS System** - J. BAILEY and N. Cox, U. S. Department of Agriculture, ARS, Russell Research Center, Athens, GA

9:15 **Use of Immunomagnetic Capture on Beads to Recover *Listeria* from Environmental Samples** - B. JACKSON, B. Mitchell, J. Milbury and A. Brookins, VICAM, Somerville, MA

9:30 **Identification of Factors Involved in the CAMP Reaction for *Listeria monocytogenes*** - R. MCKELLAR, Agriculture Canada, Ottawa, Ontario, Canada

9:45 **Enhanced Recovery and Isolation of *Salmonella* using a Novel Culture and Transfer Device** - K. ECKNER, W. Dustman, A. Rys-Rodriguez, J. Myrick and R. Smittle, Silliker Laboratories, Chicago Heights, IL

10:00 Break

10:20 **Enzyme Immunoassay for the Detection of Staphylococcal Thermonuclease in Foods** - P. BINA, R. Deibel, K. Hedlof, W. Rose and R. Reiser, Toxin Technology/ Deibel Laboratories, Sarasota, FL

10:35 **Occurrence of False Positive Tests for Staphylococcal enterotoxin using the TECRA kit** - R. DEIBEL, Deibel Laboratories/Toxin Technology, Sarasota, FL

10:50 **Time/temperature Response of Acid Phosphatase in Cooked Broiler Breast using a Fluorometric Assay** - C. DAVIS, W. Townsend and C. Lyon, U.S. Department of Agriculture, ARS, Russell Research Center, Athens, GA

11:05 **Charm Pesticide Test: Rapid Screening Method for the Detection of Organophosphate and Carbamate Pesticides for Water, Dairy Products, Fruits, Vegetables and Other Food Products** - S. SAUL, E. Zomer and S. Charm, Charm Sciences, Inc., Malden, MA

WATER REUSE IN ANIMAL PROCESSING PLANTS SYMPOSIUM
Co-Conveners: R. CARAWAN and K. RAJKOWSKI

8:30 **Water Use and Reuse in Animal Processing Plants** - R. CARAWAN, North Carolina State University, Raleigh, NC

8:50 **FSIS Perspective of Water Reuse (USDA's Regulations)** - M. ROSE, U. S. Department of Agriculture, Washimgton, DC

9:20 **EPA's Definitions/Regulations of Water** - A. DUFOUR, Environmental Protection Agency, Cincinnati, OH

9:40 **Drinking Water Associated with Waterborne Disease: Hemorrhagic Colitis** - E. RICE, Environmental Protection Agency, Cincinnati, OH

10:00 Break

10:25 **Mechanical Disinfection of Reuse Water in Poultry Plants** - C. HUXSOLL, U. S. Department of Agriculture, Albany, CA

10:45 **Chemical Disinfection of Reuse Water in Poultry Plants** - L. TSAI, U. S. Department of Agriculture, Albany, CA

11:15 **Filtration and Reconditioning of Process Water for Reuse** - B. SHELDON, North Carolina State University, Raleigh, NC

11:35 **Microbial Safety of Use of Reconditioned Plant Water** - K. RAJKOWSKI, U. S. Department of Agriculture, Philadelphia, PA

11:55 **Industry's Point of View for Use of Reconditioned Plant Water** - D. ATWOOD, American Meat Institute, Washington, DC

FUMONISIN SYMPOSIUM
Co-Conveners: L. BULLERMAN and A. DRAUGHON

8:30 **Fumonisin Production by Toxigenic Strains of *Fusarium moniliforme* and *Fusarium proliferatum* in Corn** - C. BACON and P. Nelson, U. S. Department of Agriculture, ARS, Russell Research Center, Athens, GA

9:00 **Toxicity and Role of Fumonisins in Animal Diseases and Human Esophageal Cancer** - W. NORRED, U. S. Department of Agriculture, ARS, Russell Research Center, Athens, GA

9:30 **Mechanisms of Fumonisin Toxicity and Carcinogenesis** - R. RILEY, U. S. Department of Agriculture, ARS, Russell Research Center, Athens, GA

10:00 Break

10:20 **Methods for Detection and Quantitation of Fumonisins in Corn and Cereal Products** - L. RICE and P. Ross, U. S. Department of Agriculture, National Veterinary Services Laboratory, Ames, IA

10:50 **Incidence and Levels of *Fusarium moniliforme*, *Fusarium proliferatum* and Fumonisins in Corn Based Foods and Feeds** - L. BULLERMAN and W. Tsai, University of Nebraska, Lincoln, NE

SCIENTIFIC POSTER SESSION
Convener: B. LANGLOIS

Posters will be on display from
8:30 a.m. to 3:30 p.m. on Monday and Tuesday
Authors Present 10:00 a.m. — Noon,
Tuesday, August 3, 1993

Evaluation of different media for recovery of thermally-injured *Escherichia coli* O157:H7 - N. AHMED and D. Conner, Auburn University, Auburn University, AL

Fate of Enterohemorrhagic *Escherichia coli* O157:H7 in Unpasteurized Apple Cider With and Without Preservatives - T. ZHAO, M. Doyle and R. Besser, University of Georgia, Griffin, GA

To receive information on membership with IAMFES Circle 360 on this card

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101	114	127	140	153	166	179	192	205	218	231	244	257	270	283	296	309	322	335	348
102	115	128	141	154	167	180	193	206	219	232	245	258	271	284	297	310	323	336	349
103	116	129	142	155	168	181	194	207	220	233	246	259	272	285	298	311	324	337	350
104	117	130	143	156	169	182	195	208	221	234	247	260	273	286	299	312	325	338	351
105	118	131	144	157	170	183	196	209	222	235	248	261	274	287	300	313	326	339	352
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107	120	133	146	159	172	185	198	211	224	237	250	263	276	289	302	315	328	341	354
108	121	134	147	160	173	186	199	212	225	238	251	264	277	290	303	316	329	342	355
109	122	135	148	161	174	187	200	213	226	239	252	265	278	291	304	317	330	343	356
110	123	136	149	162	175	188	201	214	227	240	253	266	279	292	305	318	331	344	357
111	124	137	150	163	176	189	202	215	228	241	254	267	280	293	306	319	332	345	358
112	125	138	151	164	177	190	203	216	229	242	255	268	281	294	307	320	333	346	359
113	126	139	152	165	178	191	204	217	230	243	256	269	282	295	308	321	334	347	360

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

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Storage Temperature and Heat Resistance of *Escherichia coli* O157:H7 in Ground Beef Patties - T. JACKSON, G. Acuff and R. Miller, Texas A&M University, College Station, TX

Growth of *Escherichia coli* O157:H7 in Ground, Roasted Beef as Affected by pH, Acidulant and Temperature - U. ABDUL-RAOUF, L. Beuchat, and M. Ammar, University of Georgia, Griffin, GA

Competitive Growth in Biofilm of *L. monocytogenes* with Cultures Isolated from a Meat Plant Environment - D. JEONG and J. Frank, Kon-Kuk University, Seoul, Korea

Interactions of Diacetate with Nitrite, Lactate, and Pediocin on Viability of *Listeria monocytogenes* in Turkey Slurries - J. SCHLYTER, J. Loeffelholz, K. Glass, A. Degnan and J. Luchansky, Food Research Institute, Madison, WI

Microbial Inhibition of *Listeria monocytogenes* by other Bacteria in a Commercial Milk and a Buffer Broth System - C. MURDOCK and K. Chung, Memphis State University, Memphis, TN

Interaction of Citric Acid Concentration and pH on the Kinetics of *Listeria monocytogenes* Inactivation - M. GOLDEN and R. Buchanan, USDA, ARS, Eastern Regional Research Center, Philadelphia, PA

Comparative Growth Rates of *Listeria monocytogenes* on Raw and Cooked Muscle Tissues - T. SHINEMAN and M. Harrison, University of Georgia, Athens, GA

Growth of *Listeria monocytogenes* at Fluctuating Temperatures - I. WALLS, R. Goins, K. Rajkowksi and R. Buchanan, USDA, ARS, Eastern Regional Research Center, Philadelphia, PA

Comparison of Methods for Isolation of *Listeria* from Rainbow Trout (*Oncorhynchus mykiss*) -B. ANTHONY, F. Draughon, M. Denton and T. Wei, University of Tennessee, Knoxville, TN

Enhanced Recovery and Isolation of *Listeria* using a Novel Culture and Transfer Device - R. SMITTLE, K. Eckner, W. Dustman, A. Rys-Rodriguez, and J. Myrick, Silliker Laboratories, Chicago Heights, IL

Comparison of Oxygen Scavengers for Their Ability to Enhance Resuscitation of Heat-injured *Listeria monocytogenes* - J. PATEL, C. Hwang, M. Doyle, L. Beuchat and R. Brackett, University of Georgia, Griffin, GA

Advanced Genotypic Typing of *Listeria monocytogenes* using Clamped Homogeneous Electric Fields (CHEF) Electrophoresis - R. BROSCH and J. Luchansky, Food Research Institute, Madison, WI

Determining Differences in Microbial Growth Rates using Linear Regression - D. SCHAFFNER and R. Dogra, Rutgers University, New Brunswick, NJ

Acid enhancement of *Clostridium perfringens* Sporulation - D. WRIGLEY, Mankato State Univ., Mankato, MN

Thermal Resistance of Spores of Non-proteolytic Type B and Type E *Clostridium botulinum* - B. EBLEN, V. Juneja, S. Palumbo, A. Williams and A. Miller, U. S. Department of Agriculture, ARS, Eastern Regional Research Center, Philadelphia, PA

Effect of Sodium Lactate on Toxigenesis of *Clostridium botulinum* in 'Sous Vide' Products - J. MENG and C. Genigeorgis, University of Georgia, Griffin, GA

Relationship of Vibrio spp. in Soft Clams and Water with *Clostridium perfringens* and Fecal Indicators - M. AROCHA, C. Barjas, J. Rupnow, L. Bullerman and C. Abeyta, University of Nebraska, Lincoln, NE

Control of Thermophilic Spore Activity with Pressurized Carbon Dioxide and Egg White Lysozyme - A. SIKES and C. Roskey, U. S. Army Natick RD&F Center, Natick, MA

Chemical Changes of Pre-packaged Sheephead during Frozen Storage - Y. HUANG, M. Zheng and K. Gates, University of Georgia, Athens, GA

Effects of trisodium phosphate and Lactic Acid on Microbiological and Physical Quality of Packaged Rainbow Trout - Y. HUANG, L. Bolton, M. Harrison and R. Toledo, University of Georgia, Athens, GA

Antimicrobial Containing Edible Films as an Inhibitory System to Control Microbial Growth on Meat Products - J. BARON and S. Sumner, University of Nebraska, Lincoln, NE

The Effectiveness of the Bacteriolytic Organism, *Bdellovibrio bacteriovorus* 109J, at Reducing the Level of Gram-Negative Foodborne Pathogens - P. FRATAMICO, R. Whiting, R. Goins and B. Marmer, U. S. Department of Agriculture, ARS, ERRC, Philadelphia, PA

Inhibition of *Salmonella typhimurium* by the Lactoperoxidase System in a Broth System and on Poultry - L. WOLFSON and S. Sumner, University of Nebraska, Lincoln, NE

Visualization of Bioluminescent *Salmonella enteritidis* in Food Samples and Penetration of *Salmonella enteritidis* to Whole-shell Eggs - J. CHEN, R. Clarke and M. Griffiths, University of Guelph, Guelph, Ontario, Canada

Effect of NaCl or Water Content on the Survival of *Salmonella typhimurium* on Irradiated Meat - D. THAYER, G. Boyd, J. Fox and L. Lakritz, USDA, ARS, Philadelphia, PA

Attachment of *Salmonella typhimurium* and *Campylobacter jejuni* to skins of Chicken Scalded at Various Temperatures - J. KIM, M. Slavik, J. Walker and C. Griffis, University of Arkansas, Fayetteville, AR

Evaluation of a Nitrocellulose Membrane Lift Method for the Detection of *Campylobacter* spp. attached to Chicken Carcasses - M. SLAVIK and H. Tsai, University of Arkansas, Fayetteville, AR

An ELISA Method for the Detection of *Campylobacter* in Raw and Processed Foods - M. PLANK, R. Durhan and B. Butman, Organon Teknika/Biotechnology Research Institute, Rockville, MD

Comparison of Tecra VIA Kit with Oxoid and CHO Cell Assay for the Detection of *Bacillus cereus* diarrheal Enterotoxin - F. SCHULTZ and R. Buchanan, U. S. Department of Agriculture, ARS, ERRC, Philadelphia, PA

Evaluation of Rapid Test Methods for Direct Detection of *Vibrio cholerae* O1 - M. WIER, J. Hasan, A. Hug, D. Bernstein, L. Loomis and R. Colwell, New Horizons Diagnostics, Columbia, MD

Detection of Coliforms in Food using Colilert — An Assessment of the effect of different sugars found in various Foods - G. DICHTER, H. Gu and P. Coombs, Environetics, Inc., Branford, CT

Bioluminescent Method for Measuring Total Viable Counts - M. WIER, D. Miller, L. Loomis and D. Bernstein, New Horizons Diagnostic, Columbia, MD

Occurrence and Production of Enterotoxin Producing Strains of *Staphylococcus aureus* in Bakery Products - D. PETERS, S. Sumner and J. Albrecht, University of Nebraska, Lincoln, NE

Yeasts Associated with Fruit Juice Concentrates - T. DEAK and L. Beuchat, University of Georgia, Griffin, GA

Use of Aerobic Plate Counts Incubated at Elevated Temperatures for Detecting Temperature-Abused Refrigerated Foods: Effectiveness under Transitory Abuse Conditions - L. BAGI and R. Buchanan, U. S. Department of Agriculture, ARS, ERRC, Philadelphia, PA

Assessment of previous Heat Treatment of Beef and Pork Products using a dry Chemistry Enzyme System - W. TOWNSEND, C. Davis and C. Lyon, U. S. Department of Agriculture, ARS, Russell Research Center, Athens, GA

Fermentation and Sensory Characteristics of Kimchi Containing KCl as a Partial Replacement for NaCl - S. CHOI, L. Beuchat, L. Perkins and T. Nakayama, University of Georgia, Griffin, GA

Characterization of Attached, Psychrotropic Bacteria Isolated from a Water Distribution System - C. DAVIDSON, P. Noble, E. Ashton, R. Andrews and W. Albritton, University of Alberta, Edmonton, Alberta, Canada

Degradation of Ochratoxin A by *Acinetobacter calcoaceticus* - C. HWANG and F. Draughon, University of Tennessee, Knoxville, TN

The PHLS Food Microbiology External Quality Assessment Scheme - D. ROBERTS, P. Van Netten, J. Russell and R. Gilbert, Food Hygiene Laboratory, London, England, U.K.

Partial Purification, Characterization and Potential Applications of Jenseniin G, a bacteriocin produced by *Propionibacterium jensenii* P126 - D. GRINSTEAD, D. Weinbrenner and S. Barefoot, Clemson University, Clemson, SC

VIDEO THEATRE
All day Monday, Tuesday morning and all day Wednesday

A list of titles and presentation times will be published at a later date

MONDAY AFTERNOON, AUGUST 2

***CAMPYLOBACTER* UPDATE SYMPOSIUM**
Sponsored by the International Life Sciences Institute
Convener: L. POST

1:30 **Human Campylobacteriosis: Clinical and Epidemiological Aspects** - P. DEMOL, University Hospital St. Pierre, Brussels, Belgium

1:50 ***Campylobacter*: A European Perspective** - M. STRINGER, Campden Food & Drink Research Association, Gloucestershire, U.K.

2:10 **Campylobacters and Their Epidemiological Markers** - H. LIOR, Laboratory Centre for Disease Control, Ottawa, Ontario, Canada

2:30 ***Campylobacter jejuni*: The U.S. Department of Agriculture Perspective** - A. MCNAMARA, U. S. Department of Agriculture, Washington, DC

2:40 ***Campylobacter jejuni*: The U. S. Food and Drug Administration Perspective** - J. MADDEN, U. S. Food and Drug Administration, Washington, DC

2:50 Break

INTERNATIONAL PERSPECTIVES ON *ESCHERICHIA COLI* O157:H7 SYMPOSIUM
Sponsored by the International Life Sciences Institute
Convener: P. HALL

3:10 ***E. coli* O157:H7 Time Capsule: What Do We Know and When Did We Know It** - M. NEILL, Brown University School of Medicine and Memorial Hospital of Rhode Island, Pawtucket, RI

3:30 ***E. coli* O157:H7 and Verotoxigenic *E. coli*** - H. LIOR, Laboratory Centre for Disease Control, Ottawa, Ontario, Canada

3:50 ***E. coli* O157:H7 - The British Experience** - B. ROWE, Central Public Health Laboratory, London, UK

4:10 ***E. coli* O157:H7 Outbreak in the Western United States** - P. TARR, University of Washington and Children's Hospital and Medical Center, Seattle, WA

4:30 ***E. coli* O157:H7: The U.S. Department of Agriculture Perspective** - A. MCNAMARA, U. S. Department of Agriculture, FSIS, Washington, DC

4:50 ***E. coli* O157:H7: The U.S. Food and Drug Administration Perspective** - J. MADDEN, U.S. Food and Drug Administration, CFSAN, Washington, DC

TECHNICAL SESSION
GENERAL FOOD MICROBIOLOGY
Co-Conveners: J. CERVENY and K. GLASS

1:30 **Comparison of Aflatoxin Production in Modified Czapek's Solution Agar, AFPA, and Dye Media** - R. HART and D. Fung, Kansas State University, Manhattan, KS

1:45 **Influence of Aflatoxin and Nutrient Concentration on the Degradative Ability of *Flavobacterium aurantiacum*** - J. LINE and R. Brackett, University of Georgia, Griffin, GA

2:00 **Determination of cytosolic aflatoxin B_1-degrading activity of *Flavobacterium aurantiacum*** - R. PHEBUS and F. Draughon, Kansas State University, Manhattan, KS

2:15 **Level of *Campylobacter* spp. on Broiler Farms and after Chicken Transport** - R. CLAVERO, N. Stern, J. Bailey, N. Cox and M. Robach, University of Georgia, Athens, GA

2:30 **Influence of Season and Storage on *Campylobacter* spp. contaminating Broiler Carcasses** - N. STERN, U.S. Department of Agriculture, ARS, Athens, GA

2:45 **Incidence of *Clostridium botulinum* in Modified Atmosphere Packaged Vegetables** - E. RHODEHAMEL, T. Lilly, H. Solomon and D. Kautter, Food and Drug Administration, Washington, DC

3:00 Break

3:20 **Prevalence of *Salmonella* in rainbow trout (*Oncorhynchus mykiss*)** - M. DENTON, F. Draughon, B. Anthony and T. Wei, University of Tennessee, Knoxville, TN

3:35 **Rates of Adherence to Stainless Steel by Foodborne Microorganisms** - S. HOOD and E. Zottola, University of Minnesota, St. Paul, MN

3:50 **Bacteria on Beef Briskets and Ground Beef: Association with Slaughter Volume and Antemortem Condemnation** - A. HOGUE and D. Dreesen, U. S. Department of Agriculture, FSIS, Washington, DC

4:05 **Compressed Air, City Water and Dust as Sources of contamination of a Dairy Aseptic Processing System** - C. LERBS, Brooklyn Center, MN

NEW HORIZONS IN DAIRY FOOD SAFETY AND QUALITY
Co-Conveners: T. KLAENHAMMER and C. WHITE

1:30 **An Overview of the Southeast Dairy Foods Research Center's Program** - T. KLAENHAMMER, North Carolina State University, Raleigh, NC

1:45 **Microbial Indicators for Dairy Food Processing** - P. FOEGEDING, North Carolina State University, Raleigh, NC

2:15 **Predictive Methodologies to Rapidly Assess Shelf Life** - C. WHITE, Mississippi State University, Mississippi State, MS

2:45 Break

3:00 **Immunological Technologies/Rapid Methods to Detection Microbial Pathogens** - M. JOHNSON, A. Bhunia, R. Wang, W. Cao and P. Steele, University of Arkansas, Fayetteville, AR

3:30 **Anitmicrobial Proteins for Dairy Food Systems** - T. KLAENHAMMER, North Carolina State University, Raleigh, NC

4:00 **Panel Discussion - What Research is Needed to Assure Dairy Food Safety and Quality?**

BAKING EQUIPMENT STANDARDS AND GENERAL SANITATION IN BAKING OPERATIONS SYMPOSIUM
Convener: M. RONGE

1:30 **BISSC Overview** - S. DETORA, Nabisco Bisquit Company, East Hanover, NJ

2:00 **Sanitary Design - A Mind Set** - D. GRAHAM, Sverdrup Corp., St. Louis, MO

2:30 **OSHA Regulatory Requirements** - J. DYKES, American Institute of Baking, Manhattan, KS

3:00 Break

3:20 **Hazard Analysis and Critical Control Points (HACCP): Concept and Use** - R. VAIL, Consultant, Minneapolis, MN

3:50 **Maintaining a High Standard of Sanitation through Equipment Design** - J. ANDERSON, American Institute of Baking, Manhattan, KS

TUESDAY MORNING, AUGUST 3

MICROBIAL CONCERNS OF THE INTERNATIONAL COMMUNITY SYMPOSIUM
Sponsored by the International Life Sciences Institute
Convener: A. BAIRD-PARKER

8:30 **Microbiological Safety of Foods in Europe of the Nineties: What Does That Imply?** - M. VAN SCHOTHORST, NESTEC Ltd., Lausanne, Switzerland

9:00 **Microbial Concerns of the North and South American Countries and Scientific Implications for Harmonizing Free Trade** - L. CRAWFORD, National Food Processors Association, Washington, DC

9:20 **Food Microbiological Criteria of the South American Countries** - S. MENDOZA, Simon Bolivar University, Caracas, Venezuela

10:00 Break

10:30 **Microbial Concerns of the Pacific Rim Countries and Scientific Implications for Harmonizing Free Trade** - M. BYLES, CSIRO Food Research Laboratory, North Ryde, New South Wales, Australia

11:00 **Safety and Quality Management through HACCP and ISO 9000** - M. STRINGER, Campden Food and Drink Research Association, Gloucestershire, UK

11:20 M. TAYLOR, Food and Drug Administration, Washington, DC

TECHNICAL SESSION
ANTIMICROBIALS
Co-Conveners: J. SCOTT and H. GOURAMA

8:30 **Antimicrobial Activity of Lactic Acid Bacteria isolated from Ready-to-Eat Turkey Products** - J. AULIK and A. Maurer, University of Wisconsin-Madison, Madison, WI

8:45 **Efficacy of Using Antagonistic Microorganisms to Inhibit Psychrotrophic Pathogens in Refrigerated, Cooked Poultry** - Y. HAO, R. Brackett and M. Doyle, University of Georgia, Griffin, GA

9:00 **The Role of Metabolic Intermediates in the Inhibition of *Salmonella enteritidis* by a *Veillonella* Species** - A. HINTON, M. Hume and J. DeLoach, Auburn University, Auburn, AL

9:15 **Inhibition of *Listeria monocytogenes* and other Bacteria by Sodium Diacetate** - L. SHELEF and L. Addala, Wayne State University, Detroit, MI

9:30 **Antimicrobial Effects of Trisodium Phosphate Against Bacteria Attached to Beef Tissue** - J. DICKSON, Iowa State University, Ames, IA

9:45 **Antilisterial Activities of Lactic Acid Salts in Sausage and the Relationship to pH and Water Activity** - L. SHELEF, Wayne State University, Detroit, MI

TECHNICAL SESSION
DAIRY
Co-Conveners: D. MARSHALL and R. SCHMIDT

8:30 **Keeping Quality of Commercially Processed Fluid Milks Held at 7.2°C (45°F) for 10, 12 and 14 days** - S. BARNARD, Penn State University, University Park, PA

8:45 **Control of Biofilm Bacteria in Dairy Sweet Water (Cooling Water) Systems** - M. CZECHOWSKI and M. Banner, Diversey Corporation, Livonia, MI

9:00 **Inhibition of Gram-Positive Pathogens in Cold-Pack Cheese Made from Cheese Containing Nisin** - T. YEZZI, A. Ajao and E. Zottola, University of Minnesota, St. Paul, MN

9:15 **Antimicrobial Use and Dairy Disease Patterns** - R. BENNETT, University of California, Santa Rosa, CA

9:30 **A Rapid Dipstick Biosensor for Beta-Lactams in Milk** - R. ROCCO, S. Deshpande, S. Kharadia and L. Lang, Idetek, Inc., Sunnyvale, CA

9:45 **Use of the Pig as a Model to Study Colonization of the Gastrointestinal Tract by Bifidobacteria and *Lactobacillus acidophilus*** - D. TOOP, C. Duitschaever, C. Buteau, C. Gyles and B. Allen, University of Guelph, Guelph, Ontario, Canada

10:00 **Problem Solving in a Dairy Quality Control Laboratory** - D. BLOMQUIST and R. L. Bakka, Klenzade, a Service of Ecolab, Tampa, FL

TECHNICAL SESSION
RISK ASSESSMENT AND EDUCATION
Co-Conveners: R. CARAWAN and E. BERRY

8:30 **Analysis of *Listeria* Risk Management for Food Processors** - L. JAYKUS and D. Amaral, University of North Carolina, Chapel Hill, NC

8:45 **The Impact of Employee Food Sanitation Knowledge and Handling Practices on Supermarket Deli Profitability** - R. GRAVANI, G. Thomas, E. McLaughlin and H. Lawless, Cornell University, Ithaca, NY

9:00 **Educating Fifth Graders About Food Safety through the Use of a Video** - G. SWICK, Columbus Health Department, Columbus, OH

9:15 **Reliability of Pop-up Timers in Turkeys** - M. LEE, Ryerson Polytechnical Institute, Toronto, Ontario, Canada

9:30 **Food Sanitation in the Ice Age** - C. FELIX, Charles Felix Associates, Leesburg, VA

SCIENTIFIC POSTER SESSION
Authors Present 10:00 — Noon

TUESDAY AFTERNOON,
AUGUST 3

GENERAL SESSION —
COMMUNICATING FOOD
SAFETY IN THE NEWS
Co-Conveners: M. DOYLE and N. STERN

1:30 **Making a Food Safety Story** - K. FLOWERS, WXIA TV, Atlanta, GA

1:45 **Impact of a News Story on the Food Industry** - L. CRAWFORD, National Food Processors Association, Washington, DC

2:00 **Criteria for a Good News Item** - S. BRONSTEIN, Atlanta Journal and Constitution, Atlanta, GA

2:15 **Do's and Don'ts for Industrial Spokespersons** - M. ROBACH, Continental Grain Co., Duluth, GA

2:30 **Public Education to Enhance Food Safety** - R. GRAVANI, Cornell University, Ithaca, NY

2:45 **Roundtable Discussion**

ANNUAL IAMFES BUSINESS MEETING

3:15 **Welcome and Introduction** - H. BENGSCH, President-Elect

3:30 **Report from the President** - M. DOYLE

3:45 **Business Meeting** - M. DOYLE, Presiding
- **Moment of Silence in Remembrance of Departed Association Members**
- **Minutes of Previous Business Meeting**
- **Report of Executive Manager**
- **Affiliate Council Report**
- **Journal Management Committee Report**
- **Old Business**
- **New Business**
- **Presentation of Resolutions** - D. GABIS, Past President

WEDNESDAY MORNING,
AUGUST 4

ILSI SPONSORED RESEARCH UPDATE
Sponsored by the International Life Sciences Institute
Convener: D. ZINK

8:30 ***Escherichia coli* O157:H7 Diarrhea in the United States: A Multicenter Surveillance Project** - P. GRIFFIN, Centers for Disease Control and Prevention, Atlanta, GA

9:00 **Establishment of Bovine Surveillance Program for *E. coli* O157:H7 in Washington State** - D. HANCOCK, Washington State University, Pullman, WA

9:30 **Insertion Sequence Fingerprinting: A New Subtyping System for *E. coli* O157:H7 Strains** - T. WHITTAM, The Pennsylvania State University, University Park, PA

10:00 Break

10:20 **Use of *In Vitro* Primer-directed Enzymatic Amplification of DNA for Rapid Detection of *Listeria monocytogenes*: Studies with Food Samples** - R. ELLISON, University of Massachusetts Medical Center, Worcester, MA

10:50 **Development of DNA Probes Specific for Virulent *Listeria* by Amplification of Virulence-related Genes of *Listeria monocytogenes*** - S. KATHARIOU, University of Hawaii at Manoa, Honolulu, HI

11:20 **Microbial Ecology of *Listeria monocytogenes* Biofilms Associated with the Food Processing Plant Environment** - J. FRANK, University of Georgia, Athens, GA

CONTROL OF BACTERIA AND PUBLIC HEALTH SIGNIFICANCE IN FOODS OF ANIMAL ORIGIN SYMPOSIUM
Co-Conveners: I. WESLEY and J. DICKSON

8:30 **Incidence in the Live Animal/NAHMS Survey** - T. GOMEZ, U. S. Department of Agriculture-APHIS, Athens, GA

9:00 **Competitive Exclusion and Poultry** - N. COX, U. S. Department of Agriculture, ARS, Athens, GA

9:30 **Intervention Methods During Processing** - D. THENO, Theno and Associates, Solan Beach, CA

10:00 Break

10:20 **Control by Natural Antimicrobials-Bacteriocins** - G. SIRAGUSA, U. S. Department of Agriculture, ARS, Clay Center, NE

10:50 **Regulatory Concerns** - A. MCNAMARA, U. S. Department of Agriculture, FSIS, Washington, DC

11:20 **Human Aspects** - P. TARR, University of Washington and Children's Hospital and Medical Center, Seattle, WA

VIRAL FOODBORNE DISEASE SYMPOSIUM
Convener: J. GUZEWICH and K. MOUNTJOY

8:30 **Viral Foodborne Disease Agents of Concern** - D. CLIVER, University of Wisconsin-Madison, Madison, WI

9:00 **The Epidemiology of Viral Foodborne Disease** - R. GLASS, Centers for Disease Control, Atlanta, GA

9:30 **Norwalk Virus Gastroenteritis** - C. MOE, University of North Carolina, Chapel Hill, NC

10:00 Break

10:20 **Detection Methods for Viral Agents** - M. SOBSEY, University of North Carolina, Chapel Hill, NC

10:50 **Hepatitis A Foodborne Disease** - T. CROMEANS, O. Nainan and H. Margolis, Centers for Disease Control and Prevention, Atlanta, GA

FDA COMPUTER DATA BASE AND REPORTING SYSTEMS SYMPOSIUM
Convener: J. SMUCKER

8:30 **National Milk Drug Residue Data Base Program** - J. SMUCKER, Food and Drug Administration, Washington, DC

9:00 **National Drug Residue Milk Monitoring Program** - R. CHILDERS, Food and Drug Adminstration, Washington, DC

9:30 **FDA Prime Connection** - A. SAYLER, Food and Drug Administration, Washington, DC

10:00 Break

10:20 **Feed Contamination and Aflatoxins Data Base Reporting** - P. RAYNES, Food and Drug Administration, Rockville, MD

10:50 **FDA Electronic Inspection System (EIS)** - A. SAYLER, Food and Drug Administration, Washington, DC

11:20 **Evaluation of Vitamins in Milk** - L. MATURIN, Food and Drug Administration, Summit Argo, IL

WEDNESDAY AFTERNOON, AUGUST 4

ECONOMICS OF FOODBORNE DISEASE SYMPOSIUM
Co-Conveners: E. TODD and T. ROBERTS

1:40 **Costs of Bacterial Foodborne Disease: A Review** - E. TODD, Health and Welfare Canada, Ottawa, Ontario, Canada

2:10 **Economic Losses Caused by Foodborne Parasitic Diseases: A Review** - T. ROBERTS, U. S. Department of Agriculture, Washington, DC

2:40 **Impact of Shellfish-Associated Viral Diseases in the United States** - J. ROSE, University of South Florida, Tampa, FL

3:05 Break

3:25 **Human Illness Costs Associated with Salmonella Infections in the United States** - T. GOMEZ and R. Tauxe, Centers for Disease Control, Atlanta, GA

3:50 **The Value of a Human Life** - A. HADDIX, Centers for Disease Control, Atlanta, GA

4:15 **Sequelae of Foodborne Diarrheic Disease: The Reactive Arthritides** - J. SMITH, U. S. Department of Agriculture, ARS, Philadelphia, PA

4:40 **Summary: Where Do We Go From Here?**

FOOD SAFETY RESEARCH NETWORKS SYMPOSIUM
Convener: R. CLARKE

1:30 **Food Safety Networking in the USDA and the Modelling Network** - R. BUCHANAN, U. S. Department of Agriculture, ARS, Philadelphia, PA

2:00 **Networking in the Southern Extension Research Activity Information Exchange Group** - S. BAREFOOT, Clemson University, Clemson, SC

2:30 **Rapid Methods Networking** - D. FUNG, Kansas State University, Manhattan, KS

3:00 Break

3:20 **Food Safety Networks in Canada** - R. CLARKE, Agriculture Canada, Guelph, Ontario, Canada

3:50 **Food Safety Applications of the Public Health Laboratory Information System** - N. BEAN, Centers for Disease Control, Atlanta, GA

LATE BREAKING REPORTS: PROTOZOA IN FOOD AND WATER - THE CASE OF CRYPTOSPORIDIUM
Convener: B. ANDERSON

1:30 **Foodborne and Waterborne Protozoa: Public Health Implications** - Speaker to be announced.

2:00 **Enteric Waterborne Protozoa: Hazard and Exposure Assessment** - J. ROSE, University of South Florida, Tampa, FL

2:30 Break

3:00 **The Milwaukee Outbreak: Lessons Learned** - Speaker to be announced.

REGULATORY ISSUES OF BIOTECHNOLOGY
Convener: R. BISHOP

1:30 **Introduction** - R. BISHOP, UW Center for Dairy Research, Madison, WI

1:40 **Biotechnology: The Regulatory Process** - J. MARYANSKI, Food and Drug Administration, Washington, DC

2:25 **The BST Approval Process** - S. SUNDLOF, University of Florida, Gainesville, FL

3:10 Break

3:30 **Biotechnology: Past, Present, Future** - M. PHILIP, United States Congress, Washington, DC

4:15 Panel Discussion

Spouse/Companion Tours and Special Events

(for more information on the tours and special events, please see the April issue of *Dairy, Food and Environmental Sanitation*, p. 253)

ATLANTA — A "PEACH" OF A TOWN
Buckhead *Martin Luther King, Jr.*
Cyclorama *Lenox Square*
Monday, August 2, 1993 — 9:00 a.m. - 2:30 p.m.
Cost: $22, Lunch on your own,
Lenox Square ($27 on-site)

THE CHARM OF THE OLD SOUTH
Covington, Georgia
Tuesday, August 3, 1993 — 9:00 a.m. - 3:30 p.m.
Cost: $37, including lunch ($42 on-site)

ATLANTA'S HOMEGROWN HITS
CNN *Underground Atlanta*
World of Coca-Cola
Wednesday, August 4, 1993 — 10:00 a.m. - 4:00 p.m.
Cost: $26, Lunch on your own ($31 on-site)

MONDAY NIGHT SOCIAL EVENT

"GRANITE" — You'll Love the Stone Mountain Plantation Evening
Monday, August 2, 1993 — 6:00 p.m. - 11:30 p.m.
Cost: $35 ($40 on-site)
Children $20 ($25 on-site)

ATLANTA BRAVES BASEBALL OUTING
Tuesday, August 3, 1993 — 6:00 p.m.
Cost: $18 ($20 on-site)

NEW THIS YEAR!
CHILDREN'S SUPERVISED ACTIVITIES
'Get Away Room'
Monday, 8:45 a.m. - 2:45 p.m.
Tuesday, 8:45 a.m. - 3:45 p.m., and
Wednesday - 9:45 a.m. - 4:15 p.m.
Free
Wednesday Kids Banquet: $10 ($15 on-site)

1993 IAMFES Workshops

Quality Assurance in Microbiology

Conducted by Michael H. Brodsky,
Ontario Ministry of Health

July 30-31, 1993, Stouffer Waverly Hotel, Atlanta, GA

If an auditor paid a surprise visit to your laboratory, would your QA program and your practices be adequate for accreditation purposes? Are your SOP's documented? Have you been meaning to develop or introduce a QA program but "haven't found the time" or are unsure how to do it?

If any of these questions make you feel uncomfortable, uneasy or embarrassed, register for the one-and-a-half day Quality Assurance Workshop for Microbiology Laboratories and put your mind at ease.

Learn how to confidently describe the QA program operating within your laboratory and outline procedures related to specific analytical protocols. Be confident in the results generated by your laboratory and ensure that your clients will not doubt the validity of the data.

Rapid Microbiological Methods

Conducted by Daniel Y.C. Fung, Kansas State University and James Dickson, Iowa State University

July 30-31, 1993, Stouffer Waverly Hotel, Atlanta, GA

A one-and-a-half day workshop on Rapid Microbiological Methods will be conducted under the direction of Daniel Y.C. Fung and Jim Dickson. The program will include lectures and hands-on experience on some systems. Commercial companies will be invited to demonstrate their systems and instruments in the workshop. With increasing awareness and concern about food safety, rapid methods in microbiology are essential as a first step to help monitor the microbial safety of our food supply and when problems arise these methods are needed to quickly pin-point the source of the problem so that actions can be taken. The workshop is designed for laboratory directors, food scientists, applied microbiologists and consultants. Appropriate hand-out materials will be provided for the partticipants in the workshop

The 1993 Workshop topics are a result of suggestions from the Applied Laboratory Methods Professional Development Group.

Informational Brochures will be available soon

Workshop Hours will be:
Friday, July 30 - 1:00 to 5:00 p.m.
Saturday, July 31 - 8:30 a.m. to 5:00 p.m.

Workshop Registration Fees are:

Before June 1, 1993		**After June 1, 1993**	
Member	$195	Member	$225
Non-Member	$235	Non-Member	$265

Informational Brochures will be available soon

For further information, please contact IAMFES at
(800)369-6337 (US), (800)284-6336 (Canada), FAX (515)276-8655

REGISTRATION FORM

❑ Rapid Microbiological Methods Workshop
❑ Quality Assurance in Microbiology Workshop

Stouffer Waverly Hotel — Atlanta, GA — July 30-31, 1993

First Name (will appear on badge) (please print) **Last** _____

Title **Employer** _____

Mailing Address (Please specify: Home Work) _____

City **State/Province** **ZIP/Postal Code** _____

Area Code & Telephone # **FAX #** _____

Charge Card Payments: VISA/MASTERCARD/AMERICAN EXPRESS

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REGISTRATION:

	Before 6/1/93	After 6/1/93
IAMFES Member	**$195**	**$225**
Non-Member	**$235**	**$265**

TOTAL AMOUNT ENCLOSED: $ _____
US FUNDS on US BANK

Limited Seating—RESERVE NOW. (Subject to cancellation)

Exp. Date _____

Signature: _____

80th IAMFES Annual Meeting Registration Form

Stouffer Waverly Hotel — Atlanta, Georgia — August 1-4, 1993

(Use photocopies for extra registrations)

FOR OFFICE USE		
Date Rec'd._____	First initial	Last name
ID#_____	Registration #_____	

***Sign up to become a NEW member**
and take advantage of the member discount.

First Name (will appear on badge) (please print) Last Name

Title Employer

Mailing Address (Please specify: Home Work)

City State Zip

Fax # Area Code & Telephone

Please check where applicable:

- ___ IAMFES Member
- ___ Non-Member
- ___ Local Arrangements
- ___ 30 Yr. Member
- ___ 50 Yr. Member
- ___ Past President
- ___ Executive Board
- ___ Speaker
- ___ Honorary Life Member
- ___ Exhibitor

Credit Card payments may be sent via Fax today! 515-276-8655

				Total Amount
Registration			Amount	
	IAMFES Member (Banquet included)		$145 ($180 on-site)	
	Non-Member (Banquet included)		$195 ($230 on-site)	
	IAMFES Student Member		$ 20 ($ 25 on-site)	
	IAMFES Member One Day (Circle: Mon/Tues/Wed)		$ 75 ($ 95 on-site)	
	Non-Member One Day (Circle: Mon/Tues/Wed)		$100 ($125 on-site)	
	Spouse/Companion (Name):_____		$ 20 ($ 20 on-site)	
	Children (14 & Under), Name: _____		FREE	
***New Membership Fees:**	Membership (*Dairy, Food & Environmental Sanitation*)		$ 50	
	Membership *Plus* (*Dairy, Food & Env. Sanitation & Journal of Food Protection*)		$ 80	
	Student Membership ❒ *Dairy, Food & Env. San.* **or** ❒ *Journal of Food Protection*		$ 25	
	Student Membership *Plus* (*Dairy, Food & Environmental Sanitation & Journal of Food Protection*)		$ 40	
	POSTAGE CHARGES: OUTSIDE THE U.S. - SURFACE RATE		$ 15 per journal	
	AIRMAIL		$ 95 per journal	
				# of tickets
Other Fees: (Per Person)	Cheese & Wine Reception (Sun., 8/1)		FREE	
	Stone Mountain Plantation Evening (Mon., 8/2)	Adult	$ 35 ($ 40 on-site)	
		Child	$ 20 ($ 25 on-site)	
	Atlanta Braves vs. Philadelphia Phillies Baseball Game (Tues., 8/3)		$ 18 ($ 20 on-site)	
	IAMFES Awards Banquet (Wed., 8/4)		$ 30 ($ 35 on-site)	
	IAMFES Kids Banquet (Wed., 8/4)		$ 10 ($ 15 on-site)	
Spouse/Companion Events:	Atlanta — A "Peach" of a Town (Mon., 8/2)		$ 22 ($ 27 on-site)	
	The Charm of the Old South (Tues., 8/3)		$ 37 ($ 42 on-site)	
	Atlanta's Homegrown Hits (Wed., 8/4)		$ 26 ($ 31 on-site)	

❒ Please indicate here if you have a disability requiring special accomodations.

Credit Card Payments: Please Circle: VISA/MASTERCARD/AMERICAN EXPRESS

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Registration Information

Send payment with registration to IAMFES, 200W Merle Hay Centre, 6200 Aurora Avenue, Des Moines, IA 50322. Make checks payable to IAMFES. Pre-registration must be post-marked by July 9, 1993. The pre-registration deadline will be strictly observed. For additional information contact Julie Heim at 1-800-369-6337 (US), 1-800-284-6336 (Canada).

Refund/Cancellation Policy

The IAMFES policy on meeting cancellation/refunds is as follows: "Registration fees, minus a $15.00 processing fee, will be refunded for written cancellations post-marked at least two (2) weeks prior to the start of the meeting. No refunds will be made for cancellations made less than two (2) weeks prior to the start of the meeting, however, the registration may be transferred to colleague with written notification to IAMFES.

Exhibitor Information

An exhibition of products and consultant services will be at the Stouffer Waverly Hotel. For more information on exhibiting at the conference, please contact Scott Wells at 1-800-369-6337, 1-800-284-6336 (Canada).

Guest Room Committment
GOOD UNTIL JULY 1, 1993
Make Your Reservation Now

HOTEL RESERVATIONS
IAMFES

80th Annual Meeting
August 1-4, 1993
Stouffer Waverly Hotel
Atlanta, Georgia

Please check accommodation requested:

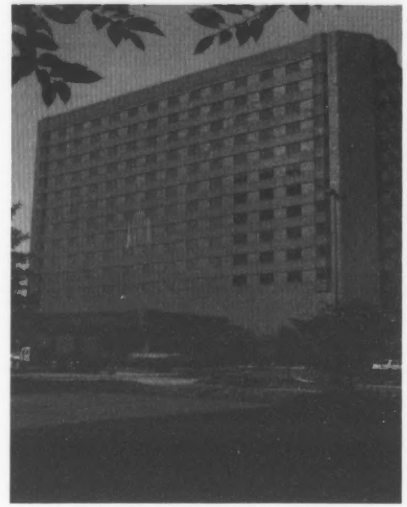
❑ Single (1 person) ❑ Triple (3 persons)
❑ Double (2 persons) ❑ Quad (4 persons)

Bed type:

❑ King Bed
❑ 2 Queen Beds

Special Requests _____

❑ Please indicate here if you have a disability requiring special accomodations.
All room rates are subject to prevailing taxes.
Reservations must be received by hotel prior to arrival.



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SPECIAL REQUESTS _____

After July 1, 1993 reservations will be accepted on a space availability basis only. Reservations will be held until 6:00 p.m. on the date of arrival, unless guaranteed by one night advance deposit, payable by certified check or a Major Credit Card.

CREDIT CARD #_____ CREDIT CARD_____

EXPIRATION DATE _____

CARD HOLDERS SIGNATURE _____

SPECIAL ROOM RATES for this convention $89 plus tax . . . single/double occupancy
$109 plus tax . . . triple occupancy
$129 plus tax . . . quad occupancy

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STOUFFER WAVERLY HOTEL
C/O RESERVATIONS
2450 GALLERIA PARKWAY
ATLANTA, GA 30339

New IAMFES Members

Alabama

Katherine C. Tamblyn
Auburn University
Auburn

Arizona

Charles R. Campbell, PHD, RS
Arizona State University
Tempe

Arkansas

Dr. Jeong-Weon Kim
University of Arkansas
Fayetteville

California

Gloria Landin
Sabatasso Foods
Santa Ana

Eddy T. Lee
Primus Laboratories
Santa Maria

Robin Merritt
Nestle Beverage Company
San Franciso

Connecticut

Lou Damion
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Pomfret Center

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Preston

Illinois

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Pet, Inc.
Greenville

Carla Bush
Evanston Health
Evanston

Indiana

Scott Freitag
Hills Pet Products
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Claire H. Lee
U. S. Army Natick
Natick

Lynn Presto
Advanced Instruments, Inc.
Norwood

Michigan

Frank Krist
District Health Department 4
Rogers City

Minnesota

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Kraft General Foods
Melrose

Todd Konietzko
Schwan's Sales Enterprises, Inc.
Marshall

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North Carolina

Maria Clara U. Smith
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Edenton

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Terri Rieckhoff
Tastemaker
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Wan-Ling Tsai
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North Charleston

South Dakota

Barb Davis
Orion Enterprises
Sioux Falls

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J. Fernando Angel
Texas A & M University
College Station

Randy Boone
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Floresville

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Nestle Foods/Beverage Co.
Dallas

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Nancy DeMille
Mead Johnson Canada
Belleville, Ontario

Todd Marrow
Christie Brown & Co.
Toronto, Ontario

James McCorry
South West Health Unit
Bridgewater, Nova Scotia

Judith Pink
St. Francis Xavier University
Antigonish, Nova Scotia

Mexico

Rebeca Alvarado Balleza
Quéretaro, Qro.

Cristina Vaqueiro
Imit, A.C.
Mexico

Business Exchange "Classifieds"

Services / Products

Coming Events

1993

June

•**4, Tennessee Association of Milk, Water and Food Protection's Annual Meeting** will be held at the Airport Ramada in Nashville, TN. For more information, please contact Dennis Lampley at (615)360-0157.

•**8-9, Texas Association of Milk, Food and Environmental Sanitarians Annual Meeting** will be held at the Wyndham Hotel, 4140 Governor's Row at Benwhite Exit off IH35, Austin, TX (512)448-2222. For more information, please contact Ms. Janie F. Park, TAMFES, P. O. Box 2363, Cedar Park, TX 78613-2363, (512)458-7281.

•**13-14, 47th Annual Rocky Mountain Region Foodservice and Lodging Convention** to be held at the Currigan Hall, Denver, CO. For more information contact tthe Colorado Restaurant Association, 899 Logan Street, Suite 300, Denver, CO 80203-9989.

•**15-17, Low Calorie Food Product Development (with IFT & CFDRA),** offered by the American Association of Cereal Chemists, will be held in Chipping, Campden, England. For more information, contact Marie McHenry, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121-2097, USA. Telephone (612)454-7250; FAX (612)454-0766.

•**15-18, Advanced Workshop in Milk Processing**, sponsored by the USPHS/FDA State Training Branch and the Minnesota Department of Agriculture to be held in St. Paul, MN. For more information contact Richard Eubanks (301)443-5871 or Mike Krim (612)296-3647.

•**20-23,** Joint International Summer Meeting of **The American Society of Agricultural Engineers and The Canadian Society of Agricultural Engineering** to be held in Spokane, WA. For more information contact The American Society of Agricultural Engineers, 2950 Niles Road, St. Joseph, MI 49085-9659, (616)429-0300; FAX (616)429-3852.

July

•**7-9, Principles of FOOD Microbiology,** sponsored by Silliker Laboratories Group, Inc., will be held in Chicago, IL. For more information contact Silliker's Education Department at (708)957-7878.

•**13-15, Basic Pasteurization Course**, sponsored by the Texas Association of Milk, Food and Environmental Sanitarians, will be held at the Le Baron Hotel, 1055 Regal Row, Dallas, TX. For more information, please contact Ms. Janie F. Park, TAMFES, P. O. Box 2363, Cedar Park, TX 78613-2363, (512)4458-7281.

•**16-23, Rapid Methods and Automation in Microbiology: International Workshop XIII** to be held at the Kansas State University, Manhattan, KS. For more information contact Dr. Daniel Y. C. Fung, Workshop Director, telephone (913)532-5654, FAX (913)532-5681. A mini--symposium will occur on July 16-17.

August

•**1-4, 80th Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, Inc.** to be held at the Stouffer Waverly Hotel, Atlanta, GA. For more information please contact Julie Heim at (800)369-6337 (US) or (800)284-6336 (Canada).

•**10-11, Mini Workshop on the Management of Refrigerated and Frozen Foods in the Distribution System**, sponsored by Purdue, Michigan State and Ohio State Universities, will be held at the Hilton Inn at the Airport, Indianapolis, IN. For program information please contact James V. Chambers, Purdue University, at (317)494-8279, William C. Haines, Michigan State University, at (517)355-2176 or Winston D. Bash, Ohio State University at (614)292-7004.

•**16-20, Special Problems in Milk Protection**, sponsored by the USPHS/FDA State Training Branch and the Pennsylvania Department of Agriculture to be held in Harrisburg, PA. For course information contact Richard Eubanks (301)443-5871 or Paul Hogue (717)787-4316.

•**17-19, Special Problems Course**, sponsored by the Texas Association of Milk, Food and Environmental Sanitarians, will be held at the Seven Oaks Hotel, 1400 Austin Hwy, San Antonio, TX. For more information, please contact Ms. Janie F. Park, TAMFES, P. O. Box 2363, Cedar Park, TX 78613-2363, (512)4458-7281.

September

•**9-10, Wisconsin Laboratory Association Annual Meeting** will be held at the Paper Valley Hotel, Appleton, WI. For more information please contact Wisconsin Laboratory Association, P. O. Box 28045, Green Bay, WI 54304.

•**16-17, Minnesota Sanitarians Association, Inc.'s Annual Meeting** will be held at the Earl Brown Center, St. Paul, MN. For more information contact Paul Nierman at (612)785-0484.

•**20-22, New York State Association of Milk and Food Sanitarians 70th Annual Conference** will be held at the Holiday Inn, Genesee Plaza, Rochester, NY. For more information contact Janene Gargiulo at (607)255-2892.

•**20-24, Special Problems in Milk Protection**, sponsored by the USPHS/FDA State Training Branch and the Nevada Department of Human Resources to be held in Reno, NV. For more information contact Richard Eubanks (301)443-5871 or Joseph Nebe (702)687-4750.

•**27-30, Insect Cell Culture and Protein Expression with Baculovirus Vectors,** sponsored by the American Type Culture Collection's Laboratory Workshops Department, will be held in Rockville, MD. For more information, please contact ATCC Workshops Manager, 12301 Parklawn Drive, Rockville, MD 20852, (301)231-5566, FAX (301)770-1805.

•**28-29, California Association of Dairy and Milk Sanitarians** will hold their Annual Meeting at the Ontario Hilton,

Ontario, CA. For more information contact John Bruhn, University of California-Davis, at (916)752-2191.

•**28-30, Wyoming Environmental Health Association Annual Education Conference**, in conjunction with the Wyoming Public Health Association, will be held at the Casper Hilton Inn, Casper, WY. For further information contact Kenneth Hoff at (307)235-9340.

October

•**3-8, 1993 National Safety Council Congress and Exposition "World Class Solutions"** will be held at the McCormick Place, Chicago, IL. For more information, please contact Robin L. Ungerleider at (708)775-2303.

•**6-8, Kansas Association of Sanitarians 64th Annual Educational Conference** will be held at the Doubletree Hotel, Overland Park, KS. For more information contact Galen Hulsing at (913)233-8961.

•**7-8, Fourteenth Annual Joint Educational Conference** sponsored by the Wisconsin Association of Milk and Food Sanitarians, Wisconsin Environmental Health Association and Wisconsin Dairy Plant Fieldmen's Association, will be held at the Chula Vista Resort, Wisconsin Dells, WI. For further information contact, Neil Vassau, Publicity Chairperson, P.O. Box 7883, Madison, WI 53707, (608)267-3504.

•**12-15, DNA Fingerprinting**, sponsored by the American Type Culture Collection's Laboratory Workshops Department, will be held in Rockville, MD. For more information, please contact ATCC Workshops Manager, 12301 Parklawn Drive, Rockville, MD 20852, (301)231-5566, FAX (301)770-1805.

•**13-14, Annual Conference of the North Central Cheese Industries Association** to be held at the Sheraton Inn Airport Hotel, Minneapolis, MN. For further information contact E.A. Zottola, Executive Secretary, NCCIA, PO Box 8113, St. Paul, MN 55108.

•**19-21, Food Preservation 2000 - Integrating Processing, Packaging, and Consumer Research** is sponsored by and held at U. S. Army Natick Research, Development and Engineering Center, Natick, MA, USA. For additional information, please contact Lisa McCormick or Sonya Herrin, Science and Technology Corporation, (804)865-7604.

•**26-28, Basic Pasteurization Course**, sponsored by the Texas Association of Milk, Food and Environmental Sanitarians, will be held at the Le Baron Hotel, 1055 Regal Row, Dallas, TX. For more information, please contact Ms. Janie F. Park, TAMFES, P. O. Box 2363, Cedar Park, TX 78613-2363, (512)4458-7281.

November

•**14-16, The Food Industry Environmental Conference and Exhibition**, presented by the Environmental Science and Technology Laboratory and Georgia Tech Research Institute, will be held at the Omni Hotel at CNN Center, Atlanta, GA. For more information contact Edd Valentine or Charles Ross at (404)894-3806.

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

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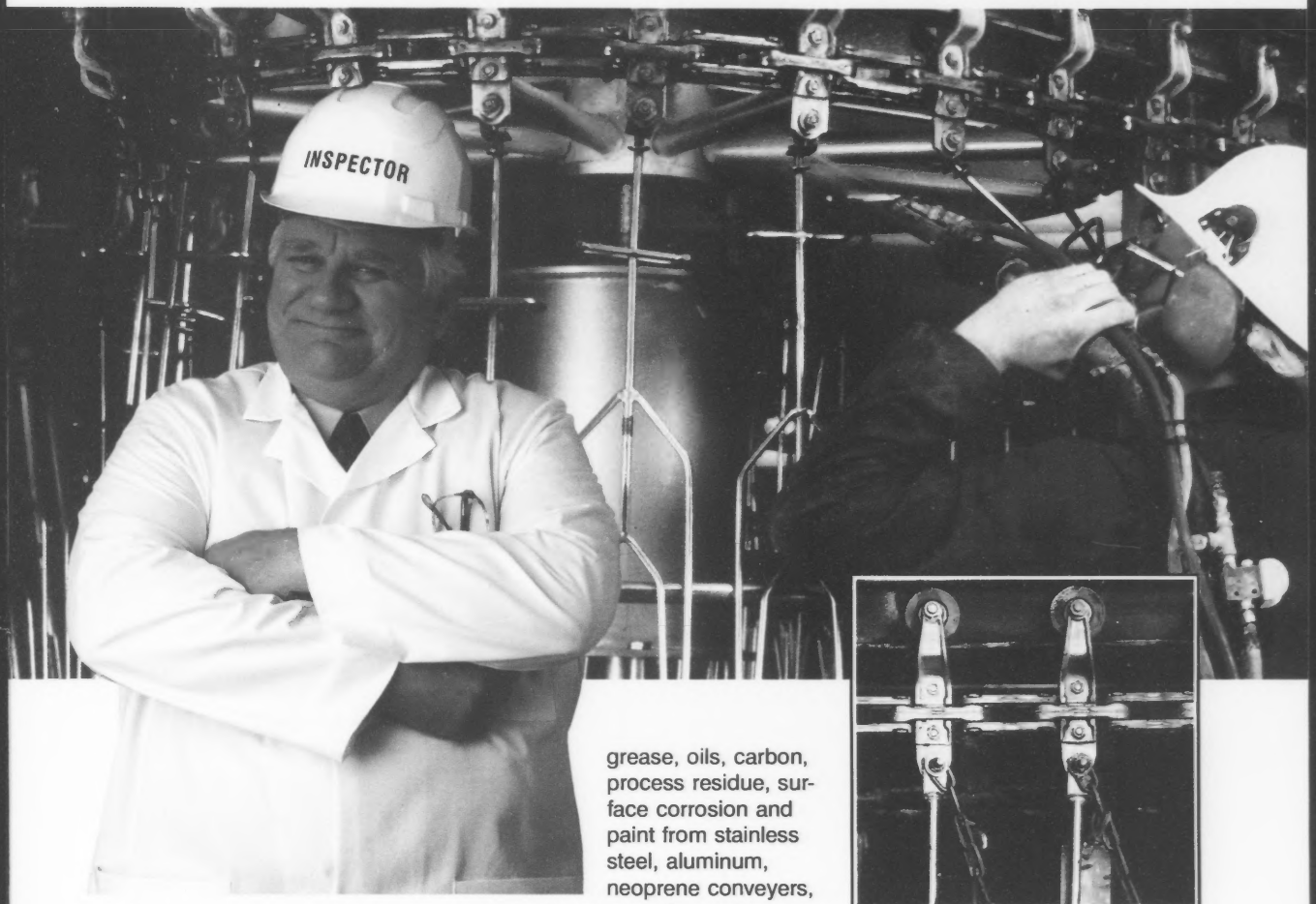

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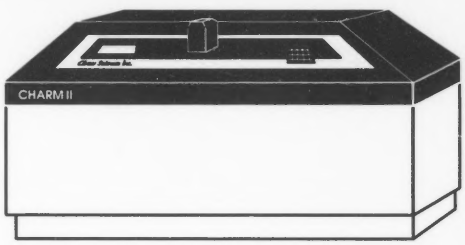

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