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Dairy and Food Sanitation

A Publication for Sanitarians and Fieldmen

- Frozen Food Handling During Distribution
- The Industrial Laboratory
- Quality Assurance for Ice Cream Manufacture

70th Annual Meeting
Marriott Pavilion
St. Louis, MO
August 7-11, 1983

Included in this issue:
70th Annual Meeting Program

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

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PRESIDENTS PERSPECTIVE

Committees Make IAMFES Go

Bob Marshall
IAMFES President

Have you considered how important the service of its committees is to IAMFES? I did, as I looked over the organization in planning for 1983. Several points came to mind as I reviewed committee works. We might all profit from sharing them.

At last count, IAMFES had about 225 persons on committees. A few are counted more than once since they serve multiple committees. Most of our committees are large, and management of such large groups is extremely difficult. It is no wonder that some committee members may question whether they are being kept well-informed of the objectives, work, progress and reporting of the committee. Furthermore, a mechanism for interaction of committees with the board has not been clearly defined of late. We are considering this.

Nevertheless, our committees have had excellent, self-motivated members and chairs. Consider the record. Our Journal Management committees, working with the editors and editorial boards, have provided two excellent journals. Many of our committees use these journals in various ways to publish their work. The Farm Methods Committee and its 12 subcommittees annually produce an extensive report. Other committees also report verbally and in writing of their progress. For example, the Committee on Communicable Disease produces formal publications such as "Procedures To Investigate Foodborne Illness."

Contributions of our committees on sanitary standards and procedures have been highly significant. Associations with 3A Sanitary Standards and publication of the standards have provided our members unique opportunities to contribute to the welfare of industry and to consumers, to grow professionally and to attain a great sense of satisfaction in having contributed to such worthy efforts. In a similar way some of our members contribute to Bakery Industry Sanitary Standards.

Several of our members work in or with laboratories. Therefore, they have a vital interest in methods, standards and laboratory supplies and equipment. Members of our Applied Laboratory Methods Committee have contributed much to Standard Methods and to the Compendium of Methods. Collaborative studies of methods have frequently originated in this committee. Presently, most of its members are serving as "consensus" referees in the classification of methods for the forthcoming 15th edition of Standard Methods for the Examination of Dairy Products.

Service on Committees for Professional and Educational Development, Membership, Sustaining Members, Foundation, Budget and Awards and on the Affiliate Council does not often earn a member the recognition deserved. Many of the tasks of these committees differ from those most of us enjoy best, but the tasks are vital to IAMFES. Those members who persevere in the work of these committees deserve our profound thanks.

Special committees and representatives to organizations outside IAMFES serve us frequently. Last year our representatives helped to start an Interstate Shellfish Sanitation Conference patterned after the Interstate Milk Shipper's Conference to which our members have long forcefully contributed. Furthermore, we participated in planning and endorsed a second National Food Protection Conference. Our representatives to the US National Committee (USNAC) on the International Dairy Federation and the National Mastitis Council have helped us understand the activities of those organizations.

IAMFES depends heavily on contributions of volunteer professionals who help focus our interest and energies on opportunities and problems that need our collective attention. To all of you, the hundreds, who give freely of yourselves to these efforts I extend the heartiest of thanks for all our members.

A deterrent to writing an article such as this is the horrible thought that some committee, representative or individual may feel left out. I've not done an exhaustive study to help avoid this, but I feel the need to address the subject is so great that the risk is worth taking. For those I may have overlooked, I apologize. You too are really appreciated.

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QUALITY ASSURANCE FOR ICE CREAM MANUFACTURE

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QUALITY DEFINED

Consumers demand their money's worth from all the products they purchase, whether it be automobiles, furniture, shoes, food, or ice cream. This is the era of consumerism.

Those in the ice cream business are entitled to ask, "How might we best be 'on guard' against the wary, aggressive buyer of our products?" Rather than being "on guard" or "plotting a defense" for production and distribution of ice cream, a considered and properly designed program of *quality assurance* is needed.

The objective of this discussion will be to analyze the role of quality assurance for ice cream manufacture and its relationship to critical customers. An immediate objective is to define quality and differentiate between the concepts of quality control and quality assurance.

Webster's dictionary describes quality as "peculiar power or property, attribute, superior birth, moral trait, degree, character." Quality dairy products are probably quality of being products of character, superior to others because of certain moral traits that are applied in dealing with certain factors of sanitation and production.

Several definitions for food quality have been suggested. Kramer and Twigg (7) defined food quality as "the composite of those characteristics that differentiate individual units of a product and have significance in determining the degree of acceptability of that unit by the user." An operational definition for quality is "a composite response derived from all the sensory properties of a specific food that cause it to be judged superior by users who have been exposed to a random selection of the product over a period of time."

Briefly, good or high food quality can be defined as the "relative degree of excellence" perceived upon evaluation of a product (3). How close is the given food or beverage to the "ideal" or the "perfect product" that so-called "experts" or experienced judges may have in mind?

Quality is more than mere conformance to a specification, a grade, or a standard. The concept of good quality refers to the sum total of performance which is reflected in the end product. The consumer measures the degree of quality found within a given product in terms of the consumption pattern for the product.

Fortunately most consumers have a strong feeling of confidence in the quality of most dairy products in the U.S. For decades the dairy foods industry has been the world leader in maintaining high standards for sanitation, nutrient content and consistent product quality. Ice cream products enjoy a very comfortable position within this perspective of dairy products.

This consumer confidence is related to the overall wholesomeness, cleanliness, palatability and nutritional dimensions of all dairy products. The U.S. has the best, safest and largest choice of foods ever offered to mankind. However, those of us associated with the diary food industry know that it is a constant challenge to maintain that record.

QUALITY CONTROL OR QUALITY ASSURANCE

Some form of monitoring, measuring, evaluating or controlling is generally essential to maintain the desired high degree of excellence for commercial ice cream. These efforts at control of the quality of a product have been referred to as quality control, or more recently, quality assurance. However, these terms are not necessarily synonymous.

Quality control is the control exercised over raw materials and the product through all phases of assembling, processing, storage and distribution, to a limited extent (*3*). Quality control evaluates and applies desired standards to products; it is concerned primarily with *things* rather than people. In the practice of quality control programs we are asking ourselves, "Are we doing things right?" *Quality control is basically a production-related function.*

Quality assurance, by contrast, asks, "Are we doing the right things?" It *is more people-oriented* and less directed at things. The ultimate product-users or consumers of ice cream are the persons of primary concern in an effective quality assurance program. Quality assurance is the composite of various tests, checks, controls and activities aimed at assurance of satisfactory performance of the product for the consumer. It is primarily a *management-related* function.

It is important to note that quality control does not necesarily address itself to consumer concerns or expectations. The broader and more encompassing "people-oriented" concept of quality assurance specifically concerns itself with performance of the product for and by the consumer.

In essence, product quality assurance (QA) programs are more sensitive, more in-depth and generally allow less tolerance for product shortcomings than do earlier quality control (QC) programs (3). There is little doubt as to which form of program is better for a company's public relations profile. An effective QA program is currently the "in" approach.

THE ACHIEVEMENT OF HIGH QUALITY

Let's briefly examine what "high quality" implies for the consumer of ice cream.

Good or high quality ice cream:

- is safe from a public health standpoint
- meets composition and nutrition labeling standards
- meets acceptable market standards of flavor, body, texture and appearance
- has a reasonable shelf life

To do the right things in production (as measured by QA program) an ice cream processor must use:

- appropriate raw materials, ingredients, flavorings and packaging
- properly designed and constructed equipment and facilities
- effective cleaning and sanitizing techniques
- properly trained and motivated personnel
- well-prescribed production procedures
- well-devised storage and distribution systems

We readily recognize that high quality must be designed into a product; it cannot be inspected into a product. If we have to rely on the health or agriculture department inspector to "shore-up" product quality, then we indeed have "business mediocrity."

The extent of sanitation, temperature control and other production factors required to achieve and assure high product quality and good shelf-life exceed the efforts needed to meet the minimum public health standards for sanitation and microbial content. An industry practice of plant sanitation and temperature control at just the level needed to barely comply with minimum regulatory standards is most short-sighted.

A progressive ice cream manufacturer in the 1980's will implement an aggressive and comprehensive QA program. If we have an aggressive sanitation, contamination and temperature control program designed to achieve extended shelf-life and product quality, then the sanitation regulations and the public health concerns will be met with plenty of margin. Just as the very successful business giant, IBM, has so insistently maintained, "There is no substitute for quality."

TOTAL QUALITY ASSURANCE

Over the years, much has been stated by "word-of-mouth", by advertising, by slogans, and in many other ways, about quality. Food product quality is the basic ingredient for the generation of sales, consumer acceptance, employee morale, and profits. We can assume that without some attention to product quality a business will suffer and probably will eventually fail.

What are the quality parameters for ice cream? How are they best measured? What does it cost? Do we "strive" for "quality control" or "quality assurance"? How do we incorporate the most effective quality assurance program into the ice cream industry of the 1980's?

The concept of quality control which best fits the nature of an ice cream manufacturer in the 1980's is most appropriately called "total quality assurance." This means that the determination of quality and its control encompasses the complete production cycle, from procurement of raw materials and ingredients, through their receipt, appraisal, formulation, production into finished products, inspection and rejection, statistical analysis, storage, transportation, and final delivery to the customer.

QUALITY IS AN IDEAL

Quality is at best an abstract thing, a bit cold, something of an ideal, that at times tends to frighten industry personnel. As stated earlier, a very simplified definition of quality is that it represents the "relative degree of excellence".

Quality has been referred to as an "experiment in industrial self-discipline" (2). From a historical perspective, we can actually think of quality as the application of a phase of religion to industry; a phase covering sanitation and cleanliness. The importance of cleanliness and sanitation to good living and health was recognized by the ancient priests of Palestinian and Babylonian days. In fact these priests regarded "the laws of health of greater importance than those which were of a ritualistic character".

"To function properly, quality needs to be close to us; in our hearts; something we do not fear, but rather need and want, like RELIGION," claims A. H. Bayer (2) in his monograph on *Modern Ice Cream Plant Management*.

A QUALITY PREMISE

An ice cream plant quality assurance program must be based on the premise that at no time between receipt of raw material and delivery of finished product is there room for compromise on the quality. It is paramount that the "cost of high quality" and its control must be recognized and included in the total product cost in order to avoid the tendency for compromise.

THE QUALITY ASSURANCE TASK

In an ice cream operation the quality assurance task embraces certain well-defined categories, which in turn are directly and indirectly involved in controlling the quality of the product up to the time and point it reaches the customer. These tasks were listed by Bayer (2) and include the following minimum segments:

1. Sampling for analysis and evaluation
2. Raw material control
   a. Non-dairy ingredients
   b. Dairy ingredients
3. Finished product control
   a. Standards and formulas
   b. Weight control
   c. Organoleptic analyses
   d. Age of products
   e. Coding
   f. Storage
4. Instrumentation control
5. Laboratory operation
6. Storage and handling of materials/products
7. Plant inspections
   a. Housekeeping
   b. Maintenance
   c. Personnel appearance
   d. Operating methods
   e. Safety
8. Cleaning and sanitizing
   a. Manual cleaning
   b. C.I.P. cleaning
   c. Sanitizing procedures
   d. Procedures for gaskets, valves, special components
   e. Storage and handling of cleaners
9. Check sheets
   a. Daily
   b. Weekly
   c. Monthly
10. Insect and rodent control
11. Complaints and their follow-up.
12. Special "operational research" projects

Generally, within each of the aforementioned categories there is the need for the use of appropriate report forms, charts, tables, graphs and check sheets. Some reports will be required daily, others weekly or monthly. These records will be for:

1. Reporting to supervisors and management personnel
2. Compliance with regulations and standards
3. Accumulating historical data for planning, future reference and establishment of trends

THE MANDATORY ELEMENTS OF Q.A.

A program for quality and sanitation control includes both *visible* and *invisible* factors. The visible factors are taste and aroma, color and appearance, body and texture. The invisible factors are bacterial content, composition, adequacy of pasteurization, sediment, etc.

From a public health standpoint, the invisible factors are more important than the visible parameters. Good product quality efforts can certainly be credited with helping safeguard public health.

As Tobias (9) has so appropriately indicated, "some aspects of quality control are forced on us, while others stem from our own choice. The legal requirements of fat and total milk solids content, coliform and total plate count and overrun are subject to checks by enforcement agencies and leave no choice but to comply".

Ice cream from several different manufacturers may have identical compliance test results and simultaneously possess entirely different sensory characteristics (i.e., flavor, body, texture, and appearance). Ice cream manufacturers have some definite alternatives when it comes to ingredient selection, handling, and processing and the extent to which these operational procedures are monitored and enforced. The degree of control which they attain over product manufacture is the determinant of product quality.

HOW DO CONSUMERS PERCEIVE "QUALITY"?

Consumers generally arrive at an impression of ice cream quality in one of two ways:

1. The composition approach
   Milk fat content
   Overrun
   Total solids
   Flavorings (type and level)
2. A differential approach
   A combination of the composition approach plus the impact of promotions, advertising, and the form of packaging

Frequently, through strong, effective promotion and advertising, and packaging graphics and style, consumers can be led to believe that a product is "more than it really is".

WHAT REALLY DETERMINES ICE CREAM QUALITY?

I believe that it is convenient to

compare the prerequisites for good ice cream quality to a four-legged milk stool. To assure high quality ice cream, the following "four legs" or key factors are essential:

1. The quality of the dairy ingredients
2. The quality of the flavoring (system) used
3. The rate of freezing and storage conditions
4. The workmanship and pride applied in manufacture

Surprisingly, several less critical factors that help determine ice cream quality are:

1. The milk fat content
2. The overrun (percent)
3. The source(s) of sweetener
4. The overall formulation (balance of ingredients)

HIGH MILKFAT: NO GUARANTEE OF QUALITY

One myth that seems to have prevailed about ice cream is that the higher the milkfat content of the product, the higher the quality. An important truism is: "High butterfat (milkfat) is not necessarily the hallmark of quality."

In the June 1981 *Consumer Reports* (*1*) survey of ice cream quality, several brands of high fat product ended up in the "good" category for sensory ratings, as opposed to "excellent". Meanwhile one of the three ice creams rated "excellent" was a mere 10% milkfat content product.

USE OF "ALL NATURAL" FLAVORINGS: OVERRATED FACTOR

The use of so-called "all natural" flavorings was not a big factor in the Consumer Reports (*1*) survey in determining the overall sensory ratings. For instance, nearly half of those judged as only "good" (8 of 17) used Category I vanilla (pure). One of the three top-rated ("excellent") products contained Category II Flavoring (partially artificial vanilla); it also contained only 10% milkfat. Furthermore, this particular brand was also judged a "best buy" by CR, based on the combination of its "excellent" rating and its lower "cost per serving".

THE FORGOTTEN ELEMENT IN ICE CREAM: DAIRY INGREDIENTS

A recent statement by White (*11*), generally summarizes many ice cream technologists' viewpoint about the most critical parameter for ice cream quality:

> Usually, the most severe off-flavor defects that expert flavor judges on ice cream quality surveys reveal are serious sensory problems that are derived from inferior quality dairy ingredients. Examples of these are: high acid, lacks freshness, metallic, old ingredient, oxidized, rancid, salty, and/or whey."

Too often, the failure of the ice cream manufacturer to screen or assess the relative quality of milk, cream, nonfat dry milk, condensed milk, whey or butter leads to a modest degree of one or more of the aforementioned listed off-flavors. Inasmuch as the dairy processor (or ice cream manufacturer) should always be the "on-hand" expert as to the relative merits of various dairy ingredients -- it merely means that we frequently do not use the resources at hand. The resource I refer to is a "set of good tastebuds" to carefully scrutinize each and every dairy ingredient incorporated into an ice cream mix.

The best quality assurance "instruments" are practically free, if we will just use them. Zall (*12*) recently stated the situation most explicitly:

> "Nature gives us the most powerful of all *Q.A. tools*, and it's called *taste*. This sense is further extended by our senses of *smell* and *sight*. Our cost for using these instruments is almost nothing. But the failure to use them in food operations can be disastrous."

Quality assurance supervisors have to work constantly in motivating personnel in receiving, production, the laboratory and quality control to undertake the necessary, timely taste-testing efforts. They have to overcome the "Q.A. ho-hums". Again, Zall (*12*) has spoken directly about this attitude problem related to flavor testing:

> ". . .pretty respectable Q.C. personnel still tend to question inflow "tasting" efforts by saying 'why run it? The product's always good.' It is just human nature for people to become bored by repetitive tests that rarely pick up bad product."

Part of the logic behind the quality assurance rationale or approach is that a Q.A. testing program is not really meant to just come up with bad results, what we are trying to do is confirm the fact that our firm's product is good! -- or up to expectations.

THE "CREAM" IN ICE CREAM

Most of the ingredients used in ice cream mixes contribute in important ways to the flavor of the ice cream. The flavor contributed by any ingredient can be: 1) desirable or 2) undesirable, depending upon the quality of the ingredient.

The best ice cream is made when fresh, carefully screened dairy ingredients are used. Cream, the primary milkfat source, is undoubtedly the most important ingredient in an ice cream mix. The milkfat will constitute from 26% to 38% of the total solids in a mix depending upon the mix formulation. Hence, the relative flavor quality, freshness, and freedom from deterioration of the cream is a prerequisite of good or exceptional flavor in ice cream. Sources of milkfat for the ice cream manufacturer include:

1. *Fresh cream* -- the best source. It must be free of any off-flavors, below 0.12% titratable acidity, properly refrigerated and stored in stainless steel equipment.

2. *Frozen cream* -- more risk of quality shortcomings. Oxidized off-flavors can develop with the extended storage time.
3. *Unsalted butter* -- can be used as necessary to replace 50-75% of the milkfat in a mix, but special incorporation methods are recommended. Various off-flavors are possible and a "greasy texture" can frequently result in the ice cream.
4. *Whole milk* -- frequently used to supply modest amounts of the milkfat needed in the mix.

The various off-flavors that can stem from the fat source include:

1. High acid (sour)
2. Rancid
3. Oxidized
4. Old ingredient
5. Lacks freshness
6. Metallic

One of the dairy industry's unfortunate shortcomings is the lack of attention it gives to separating cream, cooling, storing, and transporting it from source to point of use in ice cream mix formulation. Cream is highly perishable. It is amazing how haphazardly some processors treat this most expensive ice cream ingredient.

ICE CREAM INGREDIENTS

There are more than 1200 different flavorings, colors, stabilizers, and emulsifiers available to the commercial ice cream manufacturer. Some people are alarmed at this number of ingredients and additives available for ice cream production. However, there are probably more than 1000 different ice cream flavors possible in the U.S.; that leaves us with approximately 200 ingredients to serve such key functions as colors, stabilizers and/or emulsifiers. Manufacturer's directions should be closely followed to minimize some flavor, body, texture, and melting quality problems derived from the aforementioned ingredients.

The impact of various key ingredients on ice cream quality can be best summarized as follows:

Total Solids Content:
Too High - heavy, chewy, resistant, soggy
Too Low - weak body, coarse/icy texture, prone to "heat shock"
Sources - have some impact on quality
Non-fat Dry Milk Solids (NDM):
Proteins* - varies from 32-40%, ave. = 37%
Lactose - ~54.7%; if excess ⇨ sandiness
Ash - milk salts. Influences the behavior of certain proteins if in excess ⇨ salty taste.
*with excess heating ⇨ "cooked"
Buttermilk Solids:
Economical
Contains more milkfat than NDM, especially phospholipids ⇨ "oxidized" defect
Phospholipids behave as emulsifiers
Milkfat:
Provides richness, complimentary background flavor, and desirable body and texture properties
Too high - lacks "refreshingness" or is "greasy"
Too low- lacks richness, body or desired mouthfeel
Adverse chemical reactions ⇨ "oxidized", "rancid"
Sucrose:
Provides solids (body) and sweetness
Depresses freezing point
Fructose, Dextrose and Invert Sugar:
Depresses freezing point more than sucrose
Corn Syrup (Solids):
Depresses freezing point less than sucrose, generally
Can contribute to "syrup flavor" defect, or soft, "gummy" body
Quality descriptors - "too sweet, lacks sweetness, syrup flavor, gummy"
Corn Sweeteners:
Provide sweetness, solids and water-binding (body)
Low DE syrups - more body development properties, less sweetness and less freezing point depression than high DE syrups
May impart a "syrup flavor" and impair flavor release

FLAVOR DEFECTS IN ICE CREAM

Flavor defects in ice cream can stem from the flavoring (system) itself, the sweetener, and/or the dairy ingredients. Sources of flavor defects for each group can be as follows:

Flavoring (system)
Lacks
Too high
Unnatural (atypical)
Lacks fine flavor
Sweetener
Syrup flavor
Too sweet
Lacks sweetness
Dairy ingredients
Lacks freshness
Oxidized
Salty
Rancid
Old ingredient
Metallic
Whey

The most observed flavor defect in vanilla ice cream is "syrup flavor"; numerous surveys indicate this fact. This is a difficult off-flavor to combat --since corn syrup industry suppliers do not readily admit that there is such a thing as "syrup flavor". It is frequently blamed on "impurities" or shortcomings in the processing of corn syrups and corn syrup solids.

The functions of corn syrup in ice cream are:

1. Improved body and texture (without increasing sweetness)
2. Increased melt down resistance (heat shock protection)
3. Economics (costs less than sucrose)

Limitations of corn syrup use are:

1. Excessive lowering of freezing point (at usage rate of 25-50%)
2. Development of "syrup flavor"

LABORATORY ANALYSIS OF ICE CREAM

The authors Trunbow, Tracy, and Raffetto (*10*) best stated the need for laboratory control in the ice cream industry:

> Efficient laboratory control, ...large or small scale, manifests itself in a significant sense; hence a successful enterprise readily recognizes such control as an indispensible segment of the business.

Some of the limits to complete laboratory control in the ice cream industry include: 1) capital, 2) plant capacity and space allocation, 3) availability of qualified personnel, 4) management perspective, and 5) the cost effectiveness.

The current methods used to measure sanitary quality in ice cream manufacture include the following:

1. Sediment test
2. Standard plate count
3. Coliform test
4. Phosphatase test
5. Psychrotrophs
6. Yeast and mold

The quality assurance function within an ice cream plant has the primary responsibility for overseeing the sanitation program effectiveness of product manufacture. A well conceived sanitation monitoring program will emphasize the following minimum checkpoints:

1. Sanitation of all equipment
2. A sanitary environment for processing and storage
   a. Material surfaces-impervious to water
   b. Proper lighting and illumination
   c. Adequate ventilation
   d. Insect and rodent control
   e. Special facilities
3. Quality control procedures

MICROBIOLOGICAL ANALYSIS

Fortunately, ice cream is not as perishable as certain other milk products, such as fluid milk and cream or cottage cheese. However wholesale ice cream mixes certainly do not have indefinite shelf-life. Well conceived and practiced sanitation programs are necessary to attain the production of low bacteria counts in frozen dairy dessert mixes and frozen products. The most common sources of high bacteria counts in ice cream may be due to:

1. High bacteria counts in raw ingredients
2. Ineffective processing methods
3. Ineffective cleaning and sanitizing
4. Careless personnel practices
5. Prolonged mix storage
6. Inadequate temperature control

The ingredients of ice cream that require the most scrutiny for possible high bacteria counts and/or off-flavor are:

1. Cream
2. Bulk condensed milk
3. Fresh or frozen fruits
4. Raw nut meats
5. Special flavorings
6. Liquid color

Table 1 summarizes the recommended microbiological standards for various ice cream ingredients.

There is recent evidence from several investigators (*6,8*) that the conventional method of conducting coliform counts on mixes and frozen dairy desserts is not sufficiently sensitive to obtain accurate and reliable "indexes of sanitation". Jay (*6*) employed a new media for Gram negative bacteria; peptone bile amphotericin cycloheximide (PBAC) and reported a recovery for coliform group bacteria that was approximately 1.4 times that for the violet red bile agar (VRBA) overlay method. Ledford, et. al. (*7*) have reported on cell injury repair methods for coliform bacteria isolated from commercial ice cream. These investigators employed a preincubation step with violet red bile agar (PI-VRBA). Coliform counts (for positive samples) were nearly twice as high with the PI-VRBA method as the standard presumptive method for coliforms.

New tools are available for automated bacteria colony counting of plates that enhance efficiency and reduce per test costs when large numbers of plate counts are involved. More and more electronic apparatus can and will be applied to reducing time, costs, and interpretation of microbiological analysis in the next decade, including the ice cream industry.

COMPOSITION ANALYSIS

Many of the conventional laboratory procedures employed to conduct composition analysis of ice cream or mixes have been fraught with limited accuracy and/or are time consuming. Late developments in more sophisticated, but reliable methodology has benefited the ice cream industry.

First, various models of microwave based ovens have facilitated total solids determination for ice cream mixes in a matter of 3-5 minutes (as opposed to 60 minutes or more for vacuum oven and plate drying methods (as on the Mojonnier apparatus). These micro-wave ovens coupled with automatic top loading balances, greatly expedite the analytical process for total solids or moisture determination for ingredients and mixes.

The various new-wave instruments also simplify the ease and provide excellent accuracy and precision for milkfat, protein, and/or lactose content of ingredients and final mixes. Several equipment vendors have infrared based milk component analyzers benefiting the ice cream industry.

TABLE 1. *Recommended microbiological standards for ice cream ingredients.*

Ingredient	Raw	Pasteurized, Condensed, or Dried
	Plate count/g	
Milk	≤200,000	≤50,000
Cream	≤400,000	≤50,000
		yeast and mold/g
Egg products	≤200,000	≤ 100
Flavorings & colorings	≤ 10,000	≤ 100

Coliforms ≤10/g.

QUALITY DETERIORATION DUE TO TEMPERATURE FLUCTUATION

Certain factors related to produce formulation, processing, and storage serve to "pre-condition" ice cream to develop such undesirable defects as coarse/icy, sandiness, and/or shrunken appearance. Critical to protecting the high quality of ice cream is the maintenance of stable storage temperatures. Ideally the storage temperatures are below -10°F during in-plant handling, transport, freezer room, and retail cabinet storage.

Specific point sources of temperature fluctuation that may affect ice cream quality are:

1. Plant storage facility
2. Vehicle load-out and unload
3. Transport
4. Walk-in freezers
5. Retail display cabinets
6. Consumer abuse

A certain amount of temperature monitoring is required within the quality assurance function. The best instruments for rapidly obtaining temperature observations are several of the electronic-type thermometers that are equipped with sensitive, quick response thermister probes. Securing temperature values from ice cream package surfaces is an example of a non-destructive form of testing; usually surface temperatures obtained from placing the probe between two adjacent ice cream packages is within 1-2°F of the package contents.

The reward for quality assurance program efforts directed at minimizing temperature abuse is the greater level of confidence of placing a higher quality product in the hands of the consumer. This frequently increases your prospects of gaining a repeat customer.

FLAVOR PREFERENCE SURVEYS

Is there any correlation between experts' opinions and consumer preferences? In a 1973 Oregon State University study (*4*) on vanilla, chocolate, and strawberry ice creams, some interesting correlations were noted. There was excellent correlation between the "consumer panel" preferences and the judgements of "ice cream experts" for vanilla and strawberry ice creams. There was no correlation between experts and consumers for the four chocolate ice creams that were evaluated.

SUMMARY

In this discussion I have attempted to point out that there are some prevailing myths or misconceptions about what really determines the "eating quality" of ice cream. Some of the common overrated parameters are: fat content, overrun percentage, flavor categories and levels, and restriction of food additives.

The more important factors that determine ice cream quality are: the freshness and relative quality of dairy ingredients, flavoring balance, overall mix formulation, and the workmanship of manufacture. Our quality assurance program efforts should focus on these parameters. The Q.A. effort in the ice cream industry must rely on a combination of sensory evaluation, the latest state-of-the-art (and-science) laboratory methodology for composition analysis and efficient monitoring of microbiological aspects.

The objectives of an effective qual-assurance program for ice cream manufacture can be enumerated as follows:

1. Improve product's quality
2. Improve product's uniformity
3. Improve product's image/goodwill
4. Increase product's share of market
5. Minimize consumer complaints
6. Minimize product's loss and waste
7. Increase productivity rate
8. Provide cost effectiveness
9. Improve personnel morale
10. Profit!

REFERENCES

1. Anonymous. 1981. Ice cream. Consumer Reports. (6):316-321.
2. Bayer, A. H. 1963. Modern ice cream plant management. The Reuben H. Donnelley Corp. New York, N.Y. 260 p.
3. Bodyfelt, F. W. 1981. Dairy product score cards: are they consistent with principles of sensory evaluation? J. Dairy Science 64:2303-2308.
4. Bodyfelt, F. W., L. A. McGill, M. E. Morgan, D. D. Bills, and R. A. Scanlan. 1973. Flavor preferences for strawberry ice cream: commercial products vs. special formulation. J. Dairy Science 56(5):626-627.
5. Chambers, J. V. 1982. Protecting that ice cream quality in the distribution channels. Production Tips, NICRA. Mar. (3):5-6.
6. Cyzeska, F. J., J. A. Seiter, S. N. Marks, and J. M. Jay. 1981. Culture medium for selective isolation and enumeration of Gram-negative bacteria from ground meats. Appl. Envir. Microb. 42(2):303-307.
7. Kramer, A., and B. A. Twigg. 1966. Fundamentals of quality control for the food industry. AVI Publ. Co., Westport, CT.
8. Ledford, R. A., and J. M. Brown. 1981. Sampling variation in the determination of injured coliforms in ice cream. J. Dairy Sci. Supplement 1 64:66.
9. Tobias, J. 1982. Are your ingredients' processing steps under control? Dairy Record 83(4):88-89.
10. Turnbow, G. D., P. H. Tracy, and L. A. Raffetto. 1956. The ice cream industry. John Wiley and Sons, Inc. New York, N.Y. p. 590.
11. White, C. H. 1981. The forgotten element in ice cream - dairy ingredients. Production Tips, NICRA Newsletter, Nov. (11):5-6.
12. Zall, R. R. 1979. Taste: a powerful tool. Dairy Field (12):64,113.

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The Industrial Laboratory

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Observers think it highly unlikely that science will eventually develop a single, universal instrument that will handle practically all analyses. They do see some possibility that multiple instruments may be linked into a single sampling chain, to speed recording of multiple results.

The industrial laboratory, long an array of beakers, retorts and balances, has been tooling up with sophisticated instruments since the 1940s.

And no end is in sight. New technologies and processes, plus other hitherto unforeseen factors, promise a reinstrumentation of labs in general.

Also responsible are miniaturization, originally promoted for military and space programs, and the fast-growing use of minicomputers and the microprocessor.

New types of displays, such as digital readouts and video display terminals (cathode ray tubes), have helped to give laboratory instruments their new appearance.

The impact of transistor technology and circuits on tiny chips has provided tremendous change in laboratory appearance.

In many lab processes, the era of "push the button and walk away" is already here. In many instances it is not even necessary to walk away. Reason: the answers come up so fast.

And even now, technological evolution continues--at an accelerating pace. Computers and microprocessors are making possible replacement of manual models. More and more instruments are being used in combination or in tandem. Results, in many cases, are available in a much shorter time.

The industrial laboratory market roughly covers four areas:

- -- Research and development, which encompass analytical chemistry as well as physical and organic chemistry.
- -- Quality control for industrial hygiene, raw materials, product monitoring.
- -- Government laboratories, which must regulate certain industrial activities.
- -- And finally, training laboratories for students preparing for careers in chemistry, chemical engineering or various chemical technologies.

Industrial laboratory instrumentation consists mainly of analytical apparatus. Simply put, analytical instruments tell what something is and how much of it there is.

Most analytical equipment falls into one of three categories--molecular structure, identification and quantification of chemical elements, and separation of substances.

SPECTROPHOTOMETERS

Spectrophotometers are among the best-known instruments in analytical chemistry. Before World War II, chemists spent much of their lab time heating, melting, separating and weighing substances to analyze them. All slow tasks. Now, most of these time-consuming endeavors have been eliminated by an optical instrument, the spectrophotometer. The instrument has done much to increase laboratory output.

How does it work? It measures light, or radiant energy. It measures it by color--or wavelength. It measures those radiations that are visible to the eye, those just below our threshold of visibility (the ultraviolet region) and those just above our threshold of visibility, also invisible--the infrared region.

A spectrophotometer provides a source of light, divides it into its component wavelengths, passes it through a sample and measures how much light is transmitted or reflected at each wavelength. The information is translated into an absorption spectrum which identifies the substance and indicates the quantity present.

There are different types of spectrophotometers. Here's a quick look at them:

ULTRAVIOLET/VISIBLE SPECTROPHOTOMETER

The UV/VIS spectrophotometer is one of the most widely used instruments in analytical chemistry. Every industrial laboratory, for example, would use one for the assay of products in quality control. It has the broadest application of any analytical instrument in the world, although it is used mainly for quantitative analysis. It can be used by itself or in conjunction with other instruments.

In industry, it is used chiefly in dealing with pharmaceuticals, paints, plastics, textiles and petroleum products. It also is used in water quality assessments. It is proving particularly important in the biotechnology field, particularly in the assay of enzymes, other proteins and nucleic acids.

The most recent models employ microcomputers and substitute electronic memory for the previously used optical comparisons. The new models automatically store methods, compute results from optical data and present results on a graphic video display.

INFRARED SPECTROPHOTOMETER

The infrared spectroscopy method works because of the thousands of known chemical compounds that can be identified by the characteristic "fingerprints" each leaves in a beam of light.

The infrared spectrophotometer is more commonly used for qualitative determinations and is regarded as the most important identification apparatus in organic chemistry. So naturally it is heavily used in organic analysis. Used mainly alone, the IR spectrophotometer is employed chiefly in industries involving rubber, polymers, petrochemicals, pharmaceuticals and foods. It is also used in research and in pollution analysis.

The computer has increased the power of the infrared spectrophotometer. Thus the instrument can perform complex quantitative analyses and automate difficult identifications, searching 1,000 compounds in only a few minutes.

SPECTROPHOTOMETERS: A SUMMARY OF USES

Among the many applications of spectrophotometers in industry are:

- Analysis of pesticide chemicals in milk, vegetables, fruit and other products.
- Determination of just the right shade of amber in beer coloring, in the brewing industry. Evaluation of color in textiles, paints, paper and cosmetics.
- Grading of flour, vegetable oils, evaporated milk, catsup and chocolate.
- Rapid analysis of glass, to ensure the most efficient operation of equipment that makes glass bottles.
- Confirmation of the identity and structure of new drugs, natural extracts, human hormones and biochemicals, polymers and rubber.

HIGH PERFORMANCE LIQUID CHROMATOGRAPHY (HPLC)

High performance liquid chromatography is regarded as one of the most rapidly growing branches of analytical chemistry. It already has wide industrial applications and is seen as having the potential for being the largest branch of chemical analysis.

HPLC separates chemical mixtures by passing samples in carrier liquids through densely packed stainless-steel columns. Sometimes it is called high-pressure liquid chromatography, because the pack is so dense. Pumps are used to force the liquid to migrate through the column. The technique is also called high-speed LC, because results can be obtained in a matter of minutes in many instances. Components are separated by chemical and other interactions with the packing materials. The components migrate at different speeds through the column, and a detector indicates the mixture of components.

The major industrial users of the technique include pharmaceutical companies, polymer formulators and fabricators, food and beverage manufacturers, oil companies, paint and varnish manufacturers, agricultural chemical producers, and makers of heavy organic chemicals. HPLC also is used in quality control as well as in basic research, formulation development and environmental monitoring.

Specific examples of use of the technique in industry include:

- Quality control of soft-drink syrups in bottling plants, where sweeteners, flavors and preservatives need to be measured.
- The molecular weight distribution of polyvinyl chloride to ensure that sheeting has the correct flexibility and tensile strength.
- Analysis and measurement of lubricating oils required for rolling in the manufacture of aluminum foil.
- Measurement and detection of pesticides and herbicides in runoff waters from agricultural fields.

AMINO ACID ANALYZERS

All life forms are composed of proteins. Using an advanced form of high performance liquid chromatography, the amino acid analyzer separates, identifies and measures the free and derivatized amino acids which are the essential components of proteins.

By quantifying amino acids with the latest generation analyzers, many industries are able to maintain or improve critical qualities in widely differing products.

In food and agricultural industries, amino acid analysis is used to determine the quality of proteins in both natural and processed products. For example, ordinary varieties of field corn are low in lysine, an amino acid essential to good nutrition and growth in both humans and animals. By measuring lysine levels, agronomists and plant geneticists are aided in developing hybrid corn varieties rich in lysine and other amino acids.

To formulate dietary supplements and vitamins, the pharmaceutical industry also uses amino acid analysis. The technique helps to determine the efficacy of a wide variety of products as well as the effects of drugs under development.

The textile industry, on the other hand, produces goods made of such materials as wool and silk, which have properties depending upon and varying with their amino acid composition.

LIQUID SCINTILLATION COUNTERS

Liquid scintillation counters are highly sensitive instruments used in quantitative analysis. LS counters detect all forms of radiation but are used mainly to check on beta radiation in isolating and measuring radioactive substances. They can be used to check on toxic materials in water supplies by labeling a substance with radioactivity and then obtaining "grab" samples downstream and measuring them. They are also used to check the safety of nuclear reactors and in a number of steps in various biotechnology procedures. Results can be recorded on a video display terminal and reported on either a 20 or 80 column printer.

GAMMA COUNTERS

Gamma counters measure gamma radiations only. However, preparation of samples is unnecessary with these instruments. They are used in the medical as well as in the industrial field. Their applications involve the biotechnology and radioimmunoassay procedures.

PLASMA EMISSION SPECTROMETERS

Plasma emission spectrometers are instruments that identify and precisely measure trace concentrations of chemical elements in applications ranging from water-pollution analysis to industrial quality control. They operate using an extremely hot environment--plasma, or "electrified gas." Chemical elements in the test sample emit characteristic light frequencies so high-resolution spectrometers and multiple detectors can determine the presence and amount of several elements at the same time. In fact, the plasma emission instrument can measure 20 elements at a time. Thus it is replacing the atomic absorption approach which uses a hot-flame procedure, because atomic absorption can measure only one element at a time.

Plasma emission has become the fastest-growing analytical technique for elements and is much used in metallurgy.

The technique is used also in geology, petrochemistry and the environmental sciences.

pH METERS

pH meters are very special products to Beckman Instruments. They were the first product, the nucleus around which this company grew. Beckman built the first practical pH meter in response to a request from the California citrus industry. The original estimate of worldwide demand was 600 units. Now new applications are found almost daily, with hundreds of thousands of pH meters being sold since the first instrument was developed in 1935.

pH is the degree of acidity (sourness) or alkalinity (bitterness) of a solution. It is basic to most natural and artificial processes:

-- It is critical to the proper gelling of jams, jellies and gelatins.

-- It is an indication of the degree of degradation of meat products.

-- Keeping tomato products at a low pH helps prevent botulism.

-- Plants die if the pH of the soil is wrong; and each species has its own acceptable range.

-- Waste permits specify the pH of the final effluent.

From paint to polymers, from fish to pharmaceuticals, pH is of critical importance.

pH can be complicated to measure. Older meters used pointers and scales, like the hands and face of a watch. This led to misinterpretation of the answer and fatigue on the part of operators who were obliged to watch the meter face all day long. Delicate adjustments were frequently made and each adjustment was an invitation to err.

ION-SELECTIVE ELECTRODES

These products provide an extension of the pH technique, described earlier. The pH technique utilizes an electrode sensitive to hydrogen ions only, thus making possible the determination of degree of acidity or alkalinity. Ion-selective electrodes, also known as ion-specific electrodes, are designed to be sensitive to the levels of other ions, such as those for sodium, calcium, chloride, fluoride, cyanide and lead.

As an example of an application, they can be used in streams or liquid effluents to monitor water pollution. They are growing in popularity in food analysis.

CENTRIFUGES

Centrifuges separate substances in suspension by subjecting them to centrifugal forces. These instruments are found in almost every industrial laboratory. Wherever there's an industrial need to make such separations, centrifuges are used--from the manufacture of pharmaceuticals, cosmetics and paint, to food processing, water quality control, and a variety of biotechnology applications. In the petroleum industry, centrifuges spin down crude. They are a popular new tool for enhanced oil recovery. With a centrifuge, the porosity of rock core samples can be measured to determine the best way to recover oil from that type of subsurface structure.

Ultracentrifuges, which can develop forces exceeding 600,000 *g*, can be used for reliability testing of semiconductors. Special rotors spin the components being tested, with high force fields demonstrating what kind of stress the components can take. As with other industrial centrifuge applications, this test requires a special-purpose rotor.

OXYGEN ANALYZERS

These instruments analyze gaseous or dissolved oxygen. They are useful in the industries of brewing, winemaking and edible oils.

THE ROLE OF THE MICROPROCESSOR

The microprocessor and the microcomputer have touched off a revolution in instrumentation technology.

And this revolution is expected to continue, resulting in further automation and linking of laboratory instruments.

Briefly, a microprocessor is a computer central-processing unit constructed on a single integrated-circuit chip--or on several chips. (A central processing unit is that part of a computer containing the circuit required to interpret and execute the instruction.)

A microprocessor may be incorporated directly into the instrumentation of an automatic control system. In addition to offering the advantage of instrument control, a microprocessor can decrease probability of error in the instrument.

Actually, the day of push-button operation, and technologist "walkaway" from the instrument, has already arrived for a number of complex analyses.

Looking into the future, scientific observers see the decline of the specialist, with the general chemist becoming more important. Reason: The intermediate steps in the analytical process will be conducted automatically and specialists will not be required to grapple with cumbersome calculations.

Observers think it highly unlikely that science will eventually develop a single, universal instrument that will handle practically all analyses. They do see some possibility that multiple instruments may be linked into a single sampling chain, to speed recording of multiple results.

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Frozen Food Handling During Distribution

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Cost-effective systems are necessary for maintaining product quality of frozen food finished products during handling throughout the "Cold Chain" - from exit of the freezer through bulk cold stores, transport, distribution cold warehouses, final transport to the retail or institutional outlet, display for sale, during the "carry home" period and in-home storage. Storage temperature is the primary consideration but integrity of packaging and inventory queuing also require attention. A general trend can be discerned to maintaining colder storage temperatures while considering energy. Automated, computer controlled cold stores are a reality which require no lights, few motors and no humans inside the cold space. Containerisation has resulted in substantial improvements in temperature maintenance during shipping of frozen foods while new standards for design, testing and operation of frozen food showcases for use in displaying frozen food for sale in supermarkets are improving this link in the cold chain. Widespread use of pallets and slip sheets employing shrink wrap or stretch wrap protection contributes greatly to packaging integrity. Inventory rotation has also received some attention. Open shelf-life dating is widely recognized as being counterproductive for frozen foods. An adequate degree of concern for FIFO (First In; First Out) rotation of stocks is accorded by adopting a sequential numbering system. This system, which should not be confused with product coding, has the added advantage of taking some account of the differing stabilities (Q_{10}) of frozen foods by varying the frequency with which the number is changed.

Quick-freezing is an elegant technique for preserving indefinitely (i.e. for a far longer period than the normal distribution cycle requires) the intrinsic quality of a very wide range of highly perishable foodstuffs. It is easier to list products which do not freeze well (lettuce, fried eggs, whole tomatoes, whole melons and milk to name a few) than those which can be frozen with excellent results.

Food freezing is also deceptively easy to accomplish; it can even be performed accidentally by leaving food outside in the winter. This ease can lead to abuse of this excellent method of preservation. Presenting the original raw product quality on the ultimate consumer's plate a few weeks, months or even a year or so later calls for great attention to raw material quality, careful selection of processes and adequate packaging. The speed of the freezing process (providing this is accomplished in a matter of hours rather than weeks) is seldom critical.

After the product exists from the freezing apparatus there is still a need for adequate attention to packaging integrity, maintenance of a sufficiently cold product temperature and a system of inventory rotation to ensure that FIFO (First In: First Out) is obeyed. The relative importance of product, process and packaging criteria, the three Ps, when compared to the relative unimportance of freezing speed, temperature fluctuations and short term exposure to warm temperatures have been reviewed recently by Mogens Jul (*6*) who concluded that emphasis is often placed on the wrong aspect of handling if quality is to be optimally retained.

Temperature Management

Mechanical refrigeration began to supplant the harvesting and storage of natural ice (which had been used for centuries in the higher latitudes) in the last two decades of the nineteenth century. Thevenot (*10*) traces its use first in the manufacture of artificial ice in the southern United States, secondly in brewing both in Germany and the Northern United States, later in the transport of food (beef, mutton and butter) from Australia across the equator to western Europe and from South America to both Europe and North America.

Eighteen Hundred and Eighty saw Thomas Sutcliff Mort dispatch the first shipment of frozen food from the Antipodes in the "Strathleven" which reached Tilbury in England after a nine week voyage. The food was refrigerated by an air machine. The frozen meat trade was born. Soon South American countries as well as Australia, New Zealand and the United States were shipping frozen meat to Europe. The temperature these ships were able to hold lay between 19 and 16°F; molds can grow, given time and moisture, at these temperatures. As refrigeration capability improved the generally recognized carrying temperature in the frozen meat trade became +14°F (-10°C).

Although fruit was beginning to be frozen in the United States as early as 1904 and vegetables from 1917 the application of freezing to retail packages of a wide variety of common foods (fish, fruit and vegetables) awaited the genius of Clarence Birdseye who launched this industry in 1930 in Springfield, Massachusetts. Birdseye chose zero to -5°F (-18° to -21°C) as the required storage temperature. This temperature standard has since been hallowed by being incorporated in numerous standards, codes and recommendations, notably Codex Alimentarius (*2*), the International Institute of Refrigeration publication (*5*), AFDO Code of Practice (*1*) and the Frozen Food Round Table Code (*3*). Ice Cream is commonly held at -10°F (-23°C).

After the second world war the European and, later, the Japanese frozen food industry developed. Both of these chose to favor colder air temperatures (-22°F or -30°C) for bulk storage of frozen foods. In recent years a few cold stores have been built in the United States which are designed to operate at around -15°F (-26°C).

"Frozen foods" is very far from being a homogenous group of products with similar characteristics as far as quality retention in cold storage is concerned. Stability can conveniently be expressed as a Q_{10} (the ratio of deterioration rates at 10°C (18°F) intervals) and various categories of frozen products possess very different Q_{10}'s. Beef, especially cooked beef, enjoys a low Q_{10} as do most potato products whereas yeast-raised bakery products, fatty fish and some fin fish have high Q_{10s} and hence demand colder storage temperatures, such as -22°F, if high quality is to be retained over the many months required for distribution, to span the seasons or to take account of raw material gluts. Heen is on record (*4*) as doubting if even -22°F is cold enough to be the optimal economic temperatures for long term frozen fish storage whereas Mogens Jul (*6*) considers -22°F probably to be too cold.

The incremental cost of maintaining temperatures as cold as -22°F is, according to some authorities, surprisingly low; perhaps only 2% higher in operating costs compared to 0°F or -10°F. The value to be placed on the superior quality retention is much more difficult to estimate and may vary from market to market and from brand to brand within markets. The Japanese employ much colder temperatures (-60°C or even colder) to maintain a pristine white hue in frozen tuna intended for surimi production. Many Asian societies, on the other hand, prefer their fatty fish somewhat rancid so that warmer storage temperatures may suit their industry better.

Considerable progress has been made especially in the last four or five decades in reducing the cost of building and operating cold stores. Rigid foam insulants, under floor heating, utilizing waste heat, panel construction, superior air distribution, port doors, automated high rise racking and computerized stock records have all contributed to reduced cost and energy consumption.

Containerisation, now widely used between the Antipodes and Europe and between South Africa and Europe, has improved the handling of frozen food shipments immeasureably. No longer need shipping cases of frozen food be hand-balled in and out of reefer lockers with all the attendant opportunities for packaging damage and unwelcome humidity and temperature exposure.

Recent designs of supermarket display cases exhibit greater concern for temperature control. This is a very vulnerable link in the "Cold Chain" and seldom receives the attention it deserves as Jul (*6*) points out.

Packaging Integrity

The packaging accorded to a frozen product is also not always given the attention it deserves. Quality retention for a frozen product such as a pizza in a simple board package can be far inferior compared to the same product placed in a gas flushed impermeable inner wrap. Shelf life of a low stability product can be increased by a factor of three or even five by superior packaging.

During its passage down the "Cold Chain" it is essential that the packaging not be abused. Many frozen products are fragile at storage temperatures. Crimped pastry rims can easily be shattered, french sliced green beans can break and couvertures become detached from bakery products if cases are dropped even from quite a small height.

The recent introduction of stretch and shrink wrapping for palletized or slip sheeted loads has done much to protect outer packaging and product from damage during transport.

Inventory Control

Frozen foods in general possess a far longer high quality shelf life at recommended storage temperatures than the time normally required for storage and distribution. This means that the need to obey FIFO

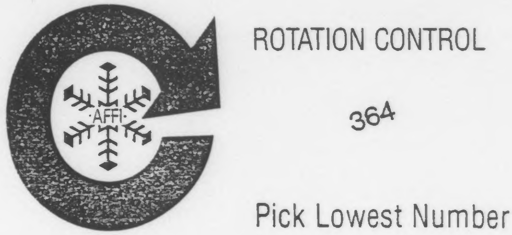


Figure 1. *Shipping case inventory control.*

(First In: First Out) is far from urgent. Nothing, however, is forever and systems are required to queue stocks at all the various facilities in which frozen foods are handled.

At the unit load level every pallet or slip sheet has a unique number and the control exercised is a part of the routine inventory handling between processors and warehouse operators.

When the unit load loses its identity there is a need for a simple, easily recognizable inventory control system to enable individual shipping cases to be selected on a FIFO basis. An industry-wide program designed to meet this need has been introduced by the American Frozen Food Institute and published by the Frozen Food Round Table (*3*). The program calls for placing a symbol (Figure 1) on one or more sides of every shipping case accompanied by either an open shelf-life date (with the instruction "pick earliest date") or a sequential number together with the instruction "Pick lowest number".

Open Shelf-Life Dating

This topic is frequently debated and some markets (e.g. Switzerland, EEC, Sweden and New South Wales) mandate that shelf-life dates (production dates, "sell by," "For best quality use by" or "Use before" dates) shall be placed on individual packets, often in conjunction with "Star Marking" storage instructions, to enable owners of "Star Marked" frozen food storage compartments to store frozen foods with confidence.

Many authorities (*2,7,8*) have reached the conclusion that open shelf-life dating is inappropriate or unlikely to be useful for frozen foods.

Sequential Numbering

If the label owner intending to introduce the industry-wide program does not wish to place a shelf-life date (a "sell by" or "for best quality use by" date) on his product the same symbol is used to identify a sequential number as the means of rotation control. This number should have no discernible relationship to the production date to avoid confusion with shelf-life dates. The frequency of change of the sequential number is at the discretion of the label owner; this frequency reflects both the stability of the contained product (a factor under the control of the processor) and the individual label owner's concern for product quality.

A seasonal fruit or vegetable product with a high stability will be adequately queued if the production of one season is distributed before the succeeding season's pack. On the other hand, a product with a comparatively low stability (e.g. fatty fish, yeast-raised bakery products) will lose quality if it is not moved in a reasonably orderly fashion through the "Cold Chain". Such a product probably deserves the rotation number be changed every two weeks or so, thereby increasing the concern by all the various handlers of shipping cases for maintaining the sequence of final packaging.

Product Coding

Confusion so often arises between product coding and any symbols, devices, numbers or dates intended for assisting inventory rotation that it is as well to define the two concepts.

Placing unique markings on every individual package of frozen food, product coding, is universally recommended as sound and ethical manufacturing practice. The two principal uses of such a code are to enable any market withdrawal of a particular batch of product to be carried out swiftly and economically and, secondly, to be able to identify the cause of any consumer comment on the product.

There is merit in this product code being cryptic. There is no benefit to the customer in being able to read this code. The code (which is a "fingerprint" of the particular packet) merely enables the label owner to trace the particular product back to the producing plant, the production line, day and shift, identify the raw material used, the process and packaging accorded and the management and labor responsible. More information can be conveyed in fewer characters and the cost of coding reduced, if a cryptic code is employed peculiar to the label owner. A further reason to use cryptic codes is that, if an open production date is used, the customer may try to use this as an indicator of product quality and be seriously misled. Product age is a very imperfect indicator of product quality in frozen foods.

REFERENCES

1. Association of Food and Drug Officials Code of Practice for Frozen Foods, 1961.
2. Codex Alimentarius. Recommended International Code of Practice for the Processing and Handling of Quick Frozen Foods, 1976.
3. Frozen Food Round Table Code of Recommended Practices for the Handling and Merchandising of Frozen Foods, 1981.
4. Heen, Erik. In paper by Per Oskar Persson. Freezing Storage, refrigeration equipment and freezing systems in the seafood industry. International Journal of Refrigeration, Vol. 5, No. 2, March, 1982.
5. International Institute of Refrigeration. Recommendations for the Processing and Handling of Frozen Foods, 1972, 2nd Edition.
6. Jul, Mogens. The Intricacies of the Freezer Chain. International Journal of Refrigeration. Vol. 5, No. 4, July, 1982.
7. Labuza, Theodore, P. Shelf-Life Dating of Foods, 1982. Food and Nutrition Press, Inc. Westport, Connecticut.
8. Office of Technology Assessment. Open Shelf-Life Dating of Food. Superintendent of Documents U.S. Government Printing Office. Stock No. 052-003-00694-4. 1979.

9. Persson, Per Oska. Frozen storage, refrigeration equipment and freezing systems in "Advances in the Refrigerated Treatment of Fish" IIR 1981-4 Proceedings of Commissions C2-D1-D2-D3, Boston, Mass. (USA)
10. Thevenot, Roger. A History of Refrigeration. International Institute of Refrigeration, 1979.

News and Events

9th Annual Food Microbiology Research Conference

The 9th Annual Food Microbiology Research Conference will be held November 2-4, 1983 in Chicago, Illinois. For more information contact: Dr. J. M. Goepfert, Canada Packers, Ltd., 2211 St. Clair Avenue West, Toronto, Ontario, Canada M6N 1K4.

Reducing Frost Formation in Pole Buildings

Pole buildings with one side open are commonly used for housing dairy animals, young stock, dry cows or the milking herd. But a common problem is frost formation on the underside of the roof in winter.

If you're having this problem, an easy first step to reduce it is to open the ridge, says Donald W. Bates, agricultural engineer with the University of Minnesota's Agricultural Extension Service. Bates recommends a full-length, clear opening of six inches for buildings 40 feet wide.

Increase the opening two inches for each additional 10 feet of building width. In many cases, you can improve environmental conditions by removing the ridge cap, Bates says. This may provide an opening four to six inches wide.

But in some construction, the nailers to which the roofing and the ridge roll are attached meet at the roof peak. Then it's necessary to saw an opening through the metal roof and remove one of the roof purlins. Relocate it on the downward side of the roof slope to support the upward edge of the metal roofing.

Continuous adjustable openings three to four feet high are also necessary. Put them in the wall away from the open side. Close them in severe winter weather, but open them at least partially as weather conditions dictate. The temperature inside the bulding must be maintained at no more than about 10 degrees F above the outside temperature.

If you have a building with both walls closed, the open ridge and wall vents on both sides are necessary. In any case, follow this rule: if condensation forms on the underside of the roof, more air movement is needed.

If a building has a high side opening, try suspending snow fence from beneath the roof to the open side to reduce draft in the building. Likewise, closing the wall for a distance of about 15 feet from each end will reduce snow swirl into the open side under adverse conditions. In some cases, a windbreak fence that is about 20 percent open may also be needed.

IFT Short Course in June

The Institute of Food Technologists will present a short course on "Food Science in the Foodservice Industry," directed primarily toward practicing foodservice management people, on June 23-24 in New Orleans.

The course will cover such topics as emerging technologies in foodservice, the scope and structure of the industry, new product concepts and product development, and special needs of the industry. Speakers will include industrial, academic and editorial experts. It will be held in the Marriott Hotel, New Orleans, and will follow IFT's annual meeting and FOOD EXPO.

For more information contact: Dan E. Weber, director of marketing/administration, IFT, 221 N. LaSalle St., Chicago, IL 60601.

Milk Vitamin Content Retained in Paperboard Cartons

Numerous studies show that milk stored in paperboard cartons retains more of its vitamin content and natural flavor than milk stored in plastic containers.

Fluorescent lighting, such as that found in most dairy cases, has been shown to cause milk to lose a significant amount of vitamins, especially vitamins A, C and B2. Flavor is also adversely affected. Pure-Pak paperboard cartons block out approximately 98% of harmful light, protecting nutrients as well as flavor. Research shows that skim and low-fat milk are especially susceptible to vitamin loss when exposed to typical dairy case lighting. Skim and low-fat milk are fortified with vitamin A, since this vitamin is lost during the skimming process. With more and more diet conscious consumers drinking skim and low-fat milk, it is important for people to be aware that up to 90% of the added vitamin A can be lost when milk is stored in plastic containers and exposed to light.

The 2-Pak gallon, which consists of two half-gallon Pure-Pak cartons joined by a paperboard handle, offers the nutritional protection of paperboard cartons and the convenience of half-gallon containers. The 2-Pak takes up less shelf space than a plastic gallon jug. The consumer gets the added benefit of being able to separate the half-gallons and open one at a time for maximum freshness. The half gallon cartons also weigh less and are easier to handle than plastic gallons, making it especially convenient for children to pour their own milk.

Microwave Oven Safety

Although the number of microwave ovens in use is at an all time high, many consumers still question their safety.

"Yet the microwave oven is the only product to show zero incidence of injury under the federal government's National Electronic Injury Surveillance System," says Bonnie Piernot, family resource management specialist. Piernot is with the Texas Agricultural Extension Service, Texas A & M University System.

Consumer doubt about microwave safety is most often due to misunderstanding about the nature of microwave radiation versus ionizing radiation or x-rays, explains Piernot.

Microwaves are a non-ionizing form of energy located between radio waves and intra-red light in the electromagnetic energy spectrum. We are constantly exposed to low levels of these types of energy without harm.

The body does not store microwaves as it does ionizing radiation. So microwaves do not cause cumulative damage to the tissue.

Overexposure to high intensity microwave energy can be hazardous. But the Food and Drug Administration requires manufacturers to meet safety standards for the amount of microwaves that can leak from an oven.

According to Piernot, recent research suggests that consumers should be more concerned about the hazards resulting from improper use of a microwave oven. Consumers can, however, easily insure safe use of the appliance by following these simple guidelines.

A microwave oven should not be used on a two-wire circuit. Using a three- to two-pin converter plug or cutting off the ground pin creates the risk of serious shock.

Only recommended materials should be used for cleaning the appliance. Abrasive plastic and wire wools can damage the surface of the oven and may eventually cause small burns around the door seal which can lead to increased leakage.

Since a damaged door can leak microwave radiation, all ovens should be placed where the door cannot be harmed by falling or by hitting other things. Also, place the oven beyond the reach of young children, because the door edges are sharp for design purposes.

Do not put chemicals into the oven for experiments at home or school.

Have only a qualified technician service the appliance. Internal filters need cleaning after 300-500 hours of operation, which amounts to about two to three years of normal home use. Household handymen run the risk of injuries from exposure to high level microwaves by attempting to service or repair an oven themselves.

When in doubt about a potential microwave hazard, Piernot suggests that consumers consult their service manual, or contact their county Extension home economist.

Unknown Enterotoxin Identified

Scientists at the University of Wisconsin-Madison have identified a previously unknown enterotoxin produced by the food poisoning bacterium *Staphylococcus aureus*. The finding means that methods used routinely to screen foods for the presence of the bacterium of its enterotoxins should be modified to detect the new toxin, according to Raoul Reiser, biochemist in the university's Department of Food Microbiology and Toxicology.

Reiser, member of a team of researchers studying *S. aureus* and its toxins, reported the finding at the annual meeting of the American Society for Microbiology in New Orleans.

Produced when staphylococci grow in improperly stored food, enterotoxins are the chemical culprits responsible for "staph" food poisoning, which is one of the most common kinds of food-borne disease. Enterotoxins acts on the intestinal lining, causing diarrhea and vomiting. The new enterotoxin is produced by a strain of *S. aureus* isolated from frozen shrimp, Reiser said.

Government food inspectors and some food manufacturers and processors routinely check food products for the presence of staphylococcal enterotoxins.

Besides being reponsible for some cases of food poisoning, the new enterotoxin may play a role in some cases of toxic shock syndrome (TSS), a sometimes fatal disease associated primarily with tampon use. Reiser was one of several University of Wisconsin researchers who in 1981 traced the cause of the disease to a previously unidentified toxin produced by strains of staphylococci isolated from TSS patients. Enterotoxins are known to produce some of the symptons of TSS in laboratory monkeys.

Reiser and co-workers used immunological methods to show that the new enterotoxin is different from already identified enterotoxins. Such methods are based on the fact that animals injected with a purified preparation of an enterotoxin produce specific antibodies against that enterotoxin. Antibodies specific for two known enterotoxins reacted partly with the new enterotoxin, showing that the new enterotoxin had some similarities to the known ones, but was not identical to either, Reiser said.

assure lasting control and to prevent reinfestation.

MAXFORCE roach control systems were developed by American Cyanamid Company. For more information contact: Cyanamid Agricultural Division, Public Affairs Dept., One Cyanamic Plaza, Wayne, NJ 07470 phone 201-831-2087.

Cockroach Control

A new system registered by the EPA for use in grocery and food marketing operations has proved 90% to 95% effective in controlling cockroaches for up to three months with a single treatment.

The system has been tested extensively over the past three years in food storage and service areas as well as in major hospitals by noted consulting entomologist Austin M. Frishman, Ph.D.

A principal benefit of the system, in addition to its long lasting effectiveness, is that it is unobtrusive and leaves no tell-tale signs to offend patrons.

Called MAXFORCE roach control system, it is available to pest control operators throughout the United States for professional use.

The new insecticide is registered by the U.S. Environmental Protection Agency for application wherever cockroaches are a problem, including food storage and service areas.

It can be used in conjunction with quick knockdown sprays to achieve long lasting control after the initial kill. Or it can be used alone where conventional sprays are prohibited or difficult to apply.

Roaches enter the station to feed and then crawl away to die, usually within four to six days.

The active ingredient in MAXFORCE is a slow acting stomach poison called amidinohydrazone, a new class of chemical compound that is effective even against cockroaches resistant to other products currently in use.

The new insecticide controls the prolific German cockroach as well as smoky brown, brown banded and other common problem roaches.

Four to six feeding stations per 100 square feet of infested area are usually adequate to achieve control. Each station remains active for up to three months to

Half-Product

British-made half-product pellets generate a whole range of unique textures which can vary from light and crispy to substantial and crunch; they were developed for snack manufacturers to deep fry, flavor and market- under their own labels.

Raw materials which can be extruded into these pellets include potato, corn, wheat and rice. Unusual and distinctive shapes can be produced; clarity is retained after frying so that the pellets are particularly suitable for character merchandising.

Using the half-product pellets eliminates the need for extruding and drying equipment (and the associatecd technical knowlege). The snack producer requires only the frying, flavoring and packaging equipment.

The pellets are deep fried on a submersible belt, which keep them beneath the oil and ensures even frying at 383 degrees F for 12 to 14 seconds according to ingredient mix. During frying, the pellets acquire texture and double or triple in size. Flavor is added before packaging.

Pellets are made by extruding a moistened farinaceous product through one of several dies into a shape which is cut into segments and dried to the required moisture content. A stable moisture level is necessary for best performance. The dry pellets are packed in polycoated bags to seal out moisture.

In cool, dry conditions, the pellets can be stored for over 12 months (although a three-month stock rotation is preferable), compared with the 12-14 week shelf life for the expanded end product. The hard, resilient pellets can be shipped easily and economically in palletized form or in bulk containers.

For more information contact: Sidney Goldman, 11901 Milberr Dr., Potomac, MD 20854. 301-983-1622.

Preventing Frozen Teats

The winter of 1982-83 may not be the coldest on record, but cases of dairy cows with frozen teats have still been reported. Ralph Farnsworth, veterinarian with the University of Minnesota Agricultural Extension Service offers advice to prevent frozen teats during the remaining cold weather months and next year.

"Dairy farmers should use teat dip with a fairly high concentration of glycerine or lanolin and cows should never be sent outside while teats are still wet," says Farnsworth. "That can occur with milking parlors or crowded barns where cows must be moved right after milking. Frozen teats also show up when cows stand out in the wind on a hill when feeding at a silage bunk, for example.

"Some people talk about blotting off excess dip. If you do, be careful to use a paper towel that you can change often as you move from cow to cow," Farnsworth cautions.

It is important to dip as long as possible into the winter months, according to Farnsworth. "There's a tendency for some dairy farmers to quit dipping in November and not start again until April. That practice leaves open the chance of bacterial infection. It's worse to freeze the teat than not to dip for a while, but some people overdo it." he says.

Cows with slight edema, particularly first-calf heifers right after calfing, are highly susceptible to freezing. Those animals need to be kept inside, Farnsworth advises.

How cold does it have to be before farmers should worry about teats freezing? "There's a lot of variation, depending on wind exposure and whether or not the cows have a place to get in," says Farnsworth. "But anytime the temperature gets down into the zero degree range--give or take 10 degrees depending on the wind--there's a chance of teats freezing."

NRA Requests Discontinuation of Sodium Bisulfite Products as Freshners

The National Restaurant Association has recently asked its members to discontinue using sodium bisulfite products as fresheners or antibrowning agents on fresh fruits and vegetables.

Sodium bisulfite is a preservative that looks like salt. It is mixed with water and used by some foodservice establishments to keep fruits and vegetables fresh and to prevent discoloration.

Recent reports indicate that sulfiting agents may present a hazard to a small number of people -- namely some individuals afflicted with asthma. In some cases, preservatives containing sulfiting agents have been linked to wheezing, severe shortness of breath and coma.

The Food and Drug Administration (FDA) is conducting a comprehensive safety review of sulfiting agents and all human food ingredients listed on the generally recognized as safe (GRAS) list. Last summer, FDA proposed regulations that would have kept sulfiting agents on the GRAS list. During the comment period questions were raised about its safety. To date, FDA has not denied or affirmed the status of sulfiting agents on the GRAS list.

Commenting on NRA's request of its members, NRA President John Dankos said, "Although FDA has not yet completed its review of the scientific evidence, we are asking our members to discontinue using preservative products containing this substance for the present. We feel that until FDA reaches a final decision, this course of action is the only way to dispel any fears and misunderstanding on the part of consumers and to protect our patrons from any possible hazard."

Hagedorn Receives Service Award from Forty-Niners

University of Wisconsin-Madison plant pathologist Donald Hagedorn, 927 University Bay Dr., Madison, received the 30th Annual Service Award from The Forty-Niners, a group serving the food processing industry, at the group's annual meeting in Los Angeles on February 5.

Hagedorn was cited for his basic research on the diseases of peas and beans. That work has led to the development of resistant varieties. "The pea and bean industry in the United States would not be what it is today if Dr. Hagedorn had not been instrumental in solving some of the disease problems that have plagued the industry from time to time," states the announcement honoring Hagedorn.

The Forty-Niners is a service group associated with the food processing industry. The group promotes progress in the food processing industry by making annual awards to recognize meritorious achievement.

Amendment to 3-A Sanitary Standards For Silo-Type Storage Tanks For Milk and Milk Products, 22-04

Number 22-05

Formulated by
International Association of Milk, Food and Environmental Sanitarians
United States Public Health Service
The Dairy Industry Committee

The 3-A Sanitary Standards for Silo-type Storage Tanks for Milk and Milk Products Number 22-04 is amended in the sections set forth below:

APPENDIX

H. *SUGGESTED CLEANING PROCEDURES*

One cleaning method found to be satisfactory is to pump the cleaning solution to the dome of the tank through stainless steel welded lines and distribute it in such a manner as to provide flooding over the entire inner dome, side walls and bottom. Another cleaning method is to jet spray by pumping the cleaning solution to the dome of the tank through a stainless steel nozzle located near the bottom of the tank. The solution should cover the entire inner dome, side walls, bottom and all other interior surfaces of the tank.

H.1

The spray device should be removable for inspection. Means should be provided for manual cleaning of all surfaces not cleaned satisfactorily by mechanical cleaning procedures.

I. *AIR VENTING*

To insure adequate venting of the tank which will protect it from internal pressure or vacuum damage during normal operation, the critical relationship between minimum vent size and maximum filling or emptying rates should be observed. The size of the free vent opening of a tank should be at least as large as those shown in the table below:

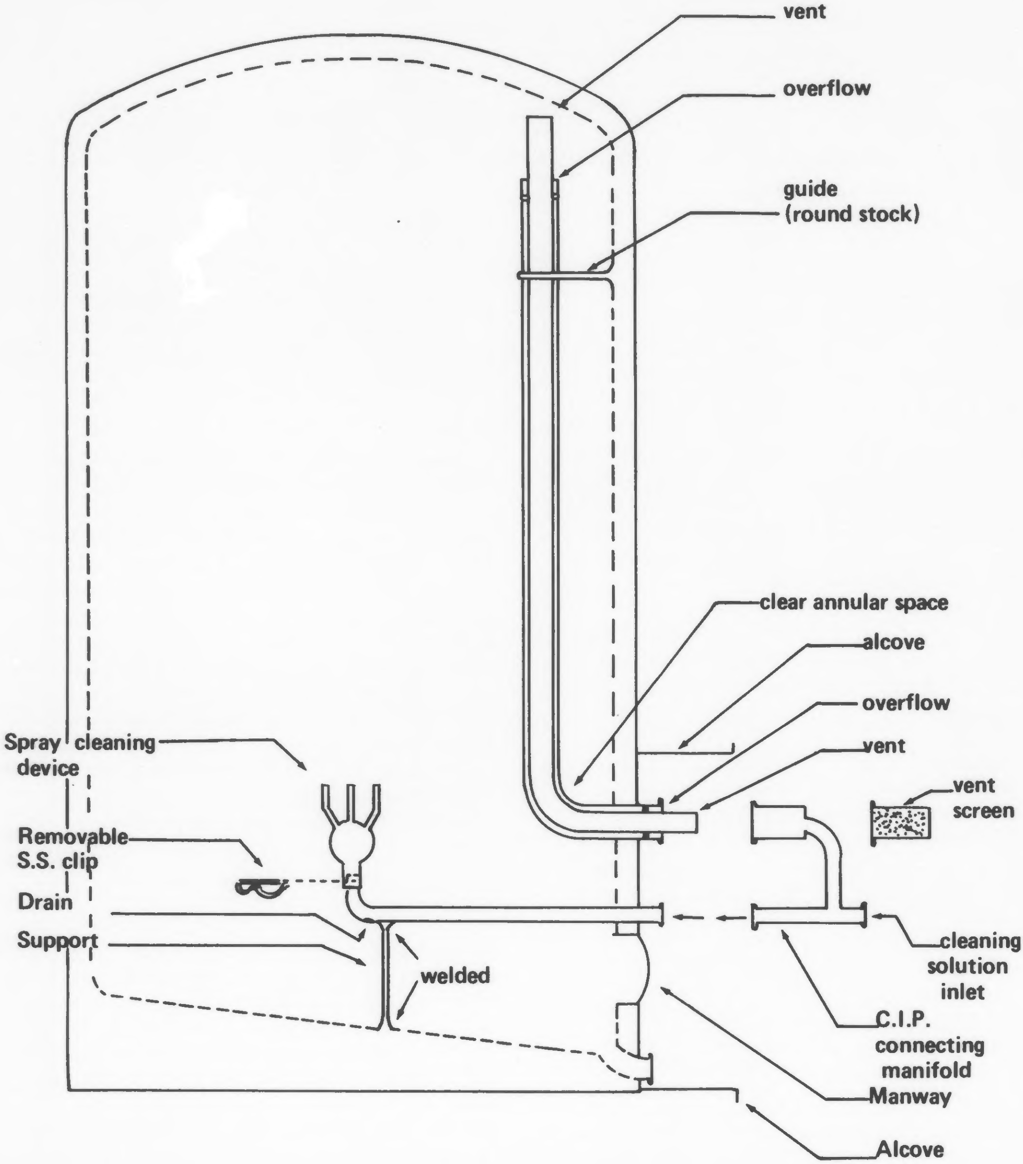
Mimimum Free Vent Opening Size		Maximum Filling Emptying Rate
(square inches)	(I.D. inches)	(gallons per minute)
2.5	1-3/4	175
4.0	2-1/4	300
6.0	2-3/4	400

The above sizes are based on normal operation and are sized to accommodate air only and not liquid. The diameter of the connecting vent pipe line between the vent opening in the tank and the control area should be no smaller than the inside diameter of the vent opening in the tank. The perforated vent cover should have a free area equal to at least 1-1/2 times the area of the vent opening in the tank. Means should be provided to prevent siphonage, such as a revent line, or anti-siphon device (see illustrative sketch in Appendix). The vent piping of a tank outside of a building should be protected against freezing. The venting system covered in the preceding paragraphs is intended to provide the venting during filling and emptying; however, it is not adequate during cleaning. During the cleaning cycle, tanks when cleaned mechanically should be vented adequately by opening the manhole door to prevent vacuum or pressure build-up due to sudden changes in temperature of very large volumes of air[5]. Means should be provided to prevent excess loss of cleaning solution through the manhole opening. The use of tempered water of about 95°F. for both pre-rinsing and post-rinsing is recommended to reduce the effect of flash heating and cooling. Provisions should be made to prevent overfilling with resultant vacuum or pressure damage to the tank.

When double-tube inside overflow and vent system is provided, the preceding table for vent overflow vent tube area sizes should also apply. During the cleaning cycle there should be a continuous flow of cleaning solution through the inner tube and the annular space of the double-tube inside overflow and vent system.

[5]*For example, when a 12,000 gallon tank (with 1600 cu. ft. of 135°F. hot air after cleaning) is suddenly flash cooled by 50°F. water sprayed at 100 gpm the following takes place: within one second, the 1600 cubic feet of hot air shrinks approximately 102 cubic feet in volume. This is the equivalent in occupied space of approximately 765 gallons of product. This shrinkage creates a vacuum sufficient to collapse the tank unless the vent, manhole, or other openings allow the air to enter the tank at approximately the same rate as it shrinks. It is obvious, therefore, that a very large air vent such as the manhole opening is required to accommodate this air flow.*

Example No. 3, a suggested method for venting



Author. . . Author. . .

When you have an interesting professional experience to relate to others in the field — submit an article to Dairy and Food Sanitation. A complete "Instruction to Authors" guide is available by contacting:

Kathy R. Hathaway
IAMFES, Inc.
P.O. Box 701
Ames, IA 50010
515-232-6699 (9 - 4 weekdays)

Calendar

May 16-20, 1983---INTERNATIONAL DAIRY FEDERATION SYMPOSIUM, Denmark. For more information contact: Canadian National Committee International Dairy Federation, 549 Sir John Carling Building, Ottawa K1A 0C5 Canada, 613-994-9537.

May 23-25, 1983---TRACE ANALYSIS OF FOODS: Flavor Problems and Contaminants. Univ. of MN, St. Paul, MN. For more information contact: Gary Reineccius, Department of Food Science and Nutrition, University of MN, St. Paul, MN 55108.

May 29-June 1---CANADIAN INSTITUTE OF FOOD SCIENCE AND TECHNOLOGY – ANNUAL CONFERENCE AND EXHIBITION. Chateau Laurier Hotel, Ottawa, Canada. For more information contact: Alex Hunt, Food Branch Industry Trade and Commerce 235 Queen Street, Ottawa, Ont. Canada K1A 0H5, 613-995-8107.

June 1-3, 1983-"ROLES OF CEREALS AND LEGUMES IN THE FOOD SUPPLY" three day symposium sponsored by the Nutritional Sciences Council of Iowa State University. For more information contact: Dr. J. Dupont, Dept. of Food and Nutrition, Iowa State University, Ames, IA 50011.

June 8, 1983-NEBRASKA DAIRY INDUSTRIES ASSOCIATION ANNUAL SPRING DAIRY OUTING, Beemer, NE. For more information contact: T. A. Evans, Executive Secretary, 134 Filley Hall, East Campus, UN-L, Lincoln, NE 68583.

June 13-14, 1983-CONFERENCES ON THE HUMAN-ANIMAL BOND, University of Minnesota. Contact: Center to Study Human-Animal Relationships and Environment 1-117 Health Sciences Unit A 515 Delaware St. S.E., Minneapolis, MN 55455.

June 14-15, 1983---TEXAS ASSOCIATION OF MILK, FOOD & ENVIRONMENTAL SANITARIANS, INC. ANNUAL MEETING. Sheraton-Safari Inn, Grand Prairie, TX. For more information contact: Clair Gothard, 1115 North MacGregor, Houston, TX 77030.

June 17-18, 1983-CONFERENCES ON THE HUMAN-ANIMAL BOND, University of California, Irvine. Contact: California College of Medicine A121 Medical Sciences I, Irvine, CA 92717.

July 3-8, 1983---67TH ANNUAL SESSION OF THE INTERNATIONAL DAIRY FEDERATION, Oslo, Norway. For further information, contact Harold Wainess, Secretary U.S. National Committee of the IDF (USNAC), 464 Central Avenue, Northfield, IL 60093, 312-446-2402.

July 9-14, 1983-ANNUAL EDUCATION CONFERENCE, National Environmental Health Association, Holiday Inn Scope, Norfolk, VA. Contact: Leon F. Vinci, Director of Health, City of Middletown, Middletown, CT 06457-1300.

July 16-23, MICROBIOLOGY WORKSHOP, Kansas State Univ. For more information contact: Dr. Daniel Fung, Call Hall, KSU, Manhatten, KS 66506, 913-532-5654.

August 1-5, 1983-"BIOTECHNOLGY: MICROBIAL PRINCIPLES AND PROCESSES FOR FUELS, CHEMICALS AND INGREDIENTS" Massachusetts Institute of Technology, Cambridge, MA 02139. Contact: Director of Summer Session, MIT, Room E 19-356, Cambridge, MA 02139.

Aug. 7-11, 1983---70th ANNUAL MEETING OF IAMFES. Marriott Pavilion, St. Louis, MO. For more information contact: Kathy R. Hathaway, IAMFES, PO Box 701, Ames, IA 50010, 515-232-6699.

Aug. 7-11, 1983---23rd ANNUAL MEETING, THE HOSPITAL, INSTITUTION, AND EDUCATIONAL FOOD SERVICE SOCIETY. Fairmont Hotel, New Orleans, LA. HIEFSS Expo '83 will be open on August 9 and 10. For more information contact: Carolyn Isch, Assistant Executive Director, HIEFSS, 4410 West Roosevelt Road, Hillside, IL 60162, 312 449-2770.

Aug. 14-19, 1983---5th WORLD CONFERENCE ON ANIMAL PRODUCTION, Nihon Toshi Center, Tokyo, Japan. For more information contact: The 5th WCAP Conference Secretarial, c/o National Institute of Animal Industry, Tsukuba Norindanchi, PO Box 5, Ibaraki 305, Japan.

Sept. 7-9---SYMPOSIUM ON LACTIC ACID BACTERIA IN FOODS: GENETICS, METABOLISM AND APPLICATIONS. Wageningen, The Netherlands. Organized by The Netherlands Society for Microbiology. For more information contact: Dr. P. M. Klapwijk, Unilever Research Laboratory, P. O. Box 114, 3130 AC Vlaardingen, The Netherlands.

Sept. 14-15, 1983 NEBRASKA DAIRY INDUSTRIES ASSOCIATION 29TH ANNUAL CONVENTION, Bellevue, NE. For more information contact: T. A. Evans, Executive Secretary, 134 Filley Hall, East Campus, UN-L, Lincoln, NE 68583.

Sept. 18-23---SIXTH WORLD CONGRESS OF FOOD SCIENCE & TECHNOLOGY, Dublin, Ireland. For more information contact: Sixth World Congress of Food Science and Technology, Congresses & Exhibition Ltd. 44, Northumberland Rd., Dublin, 4, Ireland.

Sept. 20-22---NEW YORK STATE ASSOCIATION OF MILK AND FOOD SANITATION ANNUAL MEETING. Hotel Syracuse, Syracuse, NY. For more information contact: David Bandler, Stocking Hall, Cornell University, Ithaca, NY 14853.

Oct. 22-26---FOOD AND DAIRY EXPO -83, McCormick Place, Chicago, IL. For more information contact: Dairy and Food Industries Supply Association, 6245 Executive Blvd., Rockville, MD 20852, 301-984-1444.

October 26-28---WORKSHOP IN FOOD FLAVOR: A HANDS ON COURSE IN FLAVOR DEVELOPMENT, MANUFACTURE, AND USE. For more information contact: G. Reineccius, Department of food Science and Nutrition, Univ. of MN, St. Paul, MN 55108.

Nov. 2-4, 1983 9TH ANNUAL FOOD MICROBIOLOGY RESEARCH CONFERENCE, Chicago, IL. For more information contact: Dr. J. M. Goepfert Canada Packers, Ltd., 2211 St. Clair Avenue West, Tornonto, CN M6N 1K4.

Nov. 22-24, 1984---14th ANNUAL SYMPOSIUM ON THE ANALYTICAL CHEMISTRY OF POLLUTANTS, 3rd International Congress on Analytical Techniques on Environmental Chemistry-Expoquimia, Barcelona Spain. For more information write: Av. Reina Ma. Christina Palacio No. 1, Barcelona-4 Spain.

1984

August 3-9, 1984---IAMFES ANNUAL MEETING, Edmonton, Alberta, Canada.

Nov. 22-24, 1984---14th ANNUAL SYMPOSIUM ON THE ANALYTICAL CHEMISTRY OF POLLUTANTS, 3rd International Congress on Analytical Techniques on Environmental Chemistry-Expoquimia, Barcelona Spain. For more information write: Av. Reina Ma. Christina Palacio No. 1, Barcelona-4 Spain.

PROGRAM
Seventieth Annual Meeting
International Association of
Milk, Food and Environmental Sanitarians, Inc.

In Cooperation with the
Missouri Milk, Food & Environmental Health Association
August 7-11, 1983

Marriott Pavilion **St. Louis, Missouri**

REGISTRATION TIME
Hawthorne Recreation Gallery

Sunday, August 7 - 1:00 PM - 5:00 PM
Monday, August 8 - 8:00 AM - 5:00 PM
Tuesday, August 9 - 8:00 AM - 5:00 PM
Wednesday, August 10 - 8:00 AM - 5:00 PM
Thursday, August 11 - 8:00 AM - 12:00 Noon

REGISTRATION FEES

	Advance	At Door
Registration Fee-Member	$30	$35
Registration Fee-Non-Member	40	45
Student	No Chg.	No Chg.
Spouse	10	12
Banquet	15	17

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SUNDAY-AUGUST 7, 1983

8:00 AM - 5:00 PM	Local Arrangement Committee - Senator II
1:30 PM - 5:00 PM	Executive Board Meeting - Senator I
3:00 PM - 5:00 PM	Council of State Sanitarians, Registration Agencies - Parlor Suite
6:00 PM - 7:00 PM	Early Bird Reception - Pavilion East Foyer
9:00 PM - 11:00 PM	Executive Board Meeting - Senator I

MONDAY - August 8, 1983

8:00 AM - 5:00 PM	Local Arrangements Committee - Senator II
8:00 AM - 5:00 PM	Executive Board Meeting - Senator I
8:00 AM - 5:00 PM	Spouses' Hospitality - Hawthorne I
8:00 AM - 5:00 PM	Farm Methods Subcommittees - Hawthorne II
11:00 AM - Noon	Farm Methods Committee - Hawthorne II
8:00 AM - 5:00 PM	Committee on Communicable Diseases Affecting Man - Parlor Suite
8:00 AM - 10:00 AM	Food Equipment/Sanitary Standards Committee - Parlor Suite
8:30 AM - 10:30 AM	Journal of Food Protection Management Committee - Parlor Suite
9:00 AM - 11:00 AM	Sanitarians Joint Council - Parlor Suite
10:00 AM - 11:00 AM	Nominations Committee - Envoy
10:30 AM - 12:30 PM	Dairy and Food Sanitation Management Committee - Parlor Suite

MONDAY - AUGUST 8, 1983
Afternoon

1:00 PM - 3:00 PM	Applied Laboratory Methods Committee - Envoy
1:00 PM - 3:00 PM	Baking Industry Sanitary Standards Committee - Parlor Suite
1:30 PM - 5:00 PM	National Conference on Interstate Milk Shipments - Hawthorne III
1:30 PM - 2:30 PM	Missouri Milk, Food and Environmental Health Association - Business Meeting - Hawthorne IV
3:00 PM - 5:00 PM	Council of Affiliates - Hawthorne IV
3:00 PM - 4:00 PM	IAMFES Membership Committee - Parlor Suite

MONDAY - AUGUST 8, 1983
Evening

Hawthorne I

7:00 PM - 8:00 PM	SLIDE SHOW by Mr. & Mrs. Ivan Parkin.

TUESDAY - AUGUST 9, 1983
Morning - General Session
Hawthorne II & III
A. Richard Brazis, Presiding

8:30 AM DOOR PRIZE
8:35 AM INVOCATION - Harold Bengsch, Chief Environmental Hygiene, Springfield-Green Co., Springfield, MO.
8:40 AM WELCOMING ADDRESS - William B. Hope, Jr., Sc.D., M.P.H., Health Commissioner, City of St. Louis, MO.
8:55 AM PRESIDENTIAL ADDRESS - Robert Marshall, University of Missouri, Columbia, MO.
9:25 AM BACTERIAL PLASMIDS AND GENETIC ENGINEERING: THEIR IMPACT IN FOOD MICROBIOLOGY - Larry McKay University of Minnesota, St. Paul, MN.
10:00 AM MILK BREAK
10:15 AM DOOR PRIZE
10:20 AM ANNUAL BUSINESS MEETING-Robert Marshall, President

1. Report of Secretary-Treasurer
2. Report of Executive Secretary
3. Committee Reports
4. 3-A Symbol Council Report
5. Report of Resolutions Committee
6. Report of Affiliate Council
7. Old Business
8. New Business
9. Report of Nominating Committee

TUESDAY - AUGUST 9, 1983
Afternoon - Milk Sanitation Session
Roy Ginn, Presiding
Hawthorne II

1:25 PM DOOR PRIZE
1:30 PM YESINIOSIS OUTBREAK - Carroll Sellers, Food and Drug Administration, Nashville, TN
2:00 PM THE CALIFORNIA SITUATION ON MILK STANDARDS AND FORTIFICATION - Jay Goold, League of California Milk Producers, Sacramento, CA
2:30 PM TAMPER - PROOF PACKAGING OF MILK AND MILK PRODUCTS - Charles Felix, Single Service Institute, Inc., Washington, DC.
3:00 PM MILK BREAK
3:15 PM DOOR PRIZE
3:20 PM SANITATION IN REVERSE OSMOSIS AND ULTRAFILTRATION IN THE DAIRY INDUSTRY - Gerald Luss, H.B. Fuller Company, Minneapolis, MN.
3:50 PM CONSUMER ACCEPTABILITY OF COTTAGE CHEESE CONTAINING A SODIUM SUBSTITUTE - B. J. Demott* and O. G. Sanders. The University of Tennessee, Knoxville, TN.
4:10 PM ACTIONS OF THE 1983 NCIMS CONFERENCE - Jay Boosinger, Florida Department of Agriculture, Tallahassee, FL.

4:00 PM AFFILIATE COUNCIL MEETING - Hawthorne V

TUESDAY - AUGUST 9, 1983
Evening

5:30 PM RALSTON - PURINA FARM OUTING

TUESDAY - AUGUST 9
Afternoon-Food Sanitation Session
Archie Holliday - Presiding
Hawthorne III

1:25 PM DOOR PRIZE
1:30 PM SANITATION IN THE MANUFACTURE OF CONFECTIONS - Wally Huber, Sunmark Companies, St. Louis, MO.
2:00 PM GROWTH OF INDICATOR, PATHOGENIC AND SPOILAGE BACTERIA IN MECHANICALLY SEPARATED BEEF, GROUND BEEF AND RED MARROW FROM STEERS - Bibek Ray* and R.A. Field. University of Wyoming, Laramie, WY.
2:20 PM RISKS OF SALMONELLOSIS IN THE CONSUMPTION OF PROCESSED EGG PRODUCTS - Owen J. Cotterill, University of Missouri, Columbia, MO.
2:50 PM MILK BREAK
3:05 PM DOOR PRIZE

3:10 PM RETAIL FOOD STORE SANITATION CODE - Robert Winslow, Safeway Stores, Inc., Oakland, CA.

3:40 PM MILKY SPOILAGE AND REDUCED SHELF LIFE OF COMMERCIALLY PREPARED HOT DOG WIENERS - F.A. Draughon, University of Tennessee, Knoxville, TN.

4:00 PM APPLIED VISUAL AIDS PROGRAM - Joseph Edmondson, University of Missouri, Columbia, MO.

4:20 PM VIDEO TAPE TRAINING - THE FUTURE IS NOW - Robert B. Gravani, Cornell University, Ithaca, NY.

4:00 PM AFFILIATE COUNCIL MEETING - Hawthorne V

TUESDAY - AUGUST 9
Evening

5:30 PM RALSTON - PURINA FARM OUTING

TUESDAY - AUGUST 9, 1983
Afternoon - Sanitation/Laboratory Session
Sidney Barnard - Presiding
Hawthorne IV

1:25 PM DOOR PRIZE

1:30 PM QUALITY CONTROL AND INSTRUMENTAL ANALYSIS - Remy Grappin, University of Wisconsin, Madison, WI.

2:00 PM BACTERIAL QUALITY OF STORE PURCHASED MILK SAMPLES - Sidney E. Barnard* and Cecelia E. Putman, The Pennsylvania State University, University Park, PA.

2:20 PM FLAVOR OF STORE PURCHASED SAMPLES - Sidney E. Barnard* and John L. Foley, The Pennsylvania State University, University Park, PA.

2:40 PM EVALUATION OF A NEW MINIATURIZED SYSTEM, SPECTRUM-10, FOR IDENTIFICATION OF ENTEROBACTERIACEAE - J.S. Bailey*, N.A. Cox and J.E. Thomson, Richard B. Russell Agricultural Research Center, USDA-ARS, Athens, GA.

3:05 PM MILK BREAK

3:20 PM DOOR PRIZE

3:25 PM NEW DEVELOPMENTS IN NEAR INFRARED TECHNOLOGY IN FOOD ANALYSIS - Jim Psotka, Technicon Instruments Corp., Tarrytown, NY.

3:55 PM EVALUATION OF FIVE MINIATURIZED MULTITEST SYSTEMS FOR IDENTIFICATION OF STOCK CULTURES AND FOOD ISOLATES - N.A. Cox*, J.S. Bailey and J.F. Thomson, Richard B. Russell Agricultural Research Center, USDA-ARS, Athens, GA.

4:15 PM SELECTING A MINIATURIZED SYSTEM FOR IDENTIFICATION OF ENTEROBACTERIACEAE - D.Y.C. Fung*, N.A. Cox, M.C. Goldschmidt, J.S. Bailey and J.E. Thomson. Kansas State University, Manhattan, KS.

4:35 PM TOXICOLOGICAL EVALUATION OF *CELLULOMANAS FLAVIGENA* FOR A POSSIBLE SOURCE OF SINGLE CELL PROTEIN - B.P. Dey* and M.L. Fields, University of Missouri, Columbia, MO.

4:00 PM AFFILIATE COUNCIL MEETING - Hawthorne V

TUESDAY - AUGUST 9, 1983
Evening

5:30 PM RALSTON - PURINA FARM OUTING

WEDNESDAY - AUGUST 10
Morning - General Session
Harry Haverland - Presiding
Hawthorne II & III

8:25 AM DOOR PRIZE

8:30 AM HOW TO GET A MILLION BACTERIA IN A PRODUCT WITHOUT REALLY TRYING - Paul R. Hocking, Eskimo Pie Corp., Richmond, VA.

9:00 AM THE ECONOMIC IMPACT OF FOOD SPOILAGE AND FOODBORNE DISEASE - Ewen C.D. Todd. Health Protection Branch, Tunney's Pasture, Ottawa, Ontario.

9:30 AM NET CONTENTS OF PACKAGED FOODS - Carroll S. Brickenkamp, National Bureau of Standards, Washington, DC.

10:00 AM MILK BREAK

10:15 AM DOOR PRIZE

10:20 AM MICROPROCESSORS IN THE DAIRY AND FOOD INDUSTRY - David Thompson, University of Minnesota, St. Paul, MN.

10:50 AM SOLUBLE FIBER IN HUMAN NUTRITION - Dennis Gordon, University of Missouri, Columbia, MO.

11:20 AM MUTAGENS IN COOKED FOODS - Michael W. Pariza, University of Wisconsin, Madison, WI.

WEDNESDAY - AUGUST 10, 1983
Afternoon - Milk Sanitation Session
Leon Townsend - Presiding
Hawthorne II

1:25 PM DOOR PRIZE

1:30 PM PROBLEM AREAS IN INSTALLATION AND OPERATION OF MILKING EQUIPMENT - Barry Steevens, University of Missouri, Columbia, MO.

2:00 PM MISLEADING INHIBITORY SUBSTANCES TEST RESULTS - Ronald Glass. Leuther Laboratory, Coon Valley, WI.

2:20 PM WHAT CURRENT MILK QUALITY TESTS REVEAL - David K. Bandler, Cornell University, Ithaca, NY.

2:50 PM MILK BREAK

3:05 PM DOOR PRIZE

3:10 PM CLEANING LARGE BULK TANKS AND PIPELINE SYSTEMS - Phillip W. Parsons, Maryland & Virginia Milk Producers Association, Culpeper, VA.

3:40 PM THE REGULATION OF GOAT MILK PRODUCTION AND PROCESSING - Henry Atherton, University of Vermont, Burlington, VT.

4:10 PM CROSS CONNECTIONS: PROTECTIVE DEVICES - Walter M. Staton, Watts Regulator Company, Mauldin, SC.

4:40 PM THE INTERNATIONAL DAIRY FEDERATION AND THE U.S. NATIONAL COMMITTEE - Harold Wainess, Harold Wainess & Associates, Northfield, IL.

WEDNESDAY - AUGUST 10, 1983
Afternoon - Food Sanitation Session
Hawthorne III
Ron Blumer - Presiding

1:25 PM DOOR PRIZE

1:30 PM MICRO-ENVIRONMENT OF FOOD PROCESSING EQUIPMENT - Burt Maxcy, University of Nebraska, Lincoln, NE.

2:00 PM AEROBIC VERSUS ANAEROBIC INCUBATION FOR RECOVERY OF SALMONELLA - J.S. Bailey*, J.O. Reagan, N.A. Cox, and J.E. Thomson. Richard B. Russell Research Center, USDA-ARS, Athens, GA.

2:20 PM INHIBITION OF PATULIN PRODUCTION BY POTASSIUM SORBATE - Lloyd Bullerman, University of Nebraska, Lincoln, NE.

2:40 PM MILK BREAK

2:55 PM DOOR PRIZE

3:00 PM EFFICACY OF VARIOUS MEDIA FOR DETECTION OF *SALMONELLA* IN POULTRY PRODUCTS - N.A. Cox*, J.Y. Chiu, J.S. Bailey, G.W. Krumm, J.E. Thomson and R. W. Johnston. Richard B. Russell Agricultural Center, USDA-ARS, Athens, GA.

3:30 PM EFFECT OF LIPID CONTENT OF FISH AND TEMPERATURE-TIME OF DRYING ON FUNCTIONAL PROPERTIES AND NUTRITIONAL VALUE OF FISH DURING DEHYDRATION - R.H. Chen*, Y.W. Wu and S.S. Wang. National Taiwan College Marine Science Technology, Keelung, Taiwan, Republic of China.

3:50 PM	EFFECT OF MOLECULAR WEIGHT AND DISPERSABILITY OF SOYBEAN PROTEIN ON THE CAPACITY OF SURFACE FILM FORMATION - R.H. Chen* and C.K. Rha. National Taiwan College Marine Science Technology, Keelung, Taiwan, Republic of China.
4:10 PM	U.S.D.A. TOTAL QUALITY PROGRAM - John McKelvey, USDA, Washington, DC.
4:40 PM	RADIOMETRIC SALMONELLA SCREENING - Dean Reed. Ross Laboratories, Columbus, OH.

WEDNESDAY - AUGUST 10, 1983

7:30 AM	NATIONAL MASTITIS COUNCIL EXECUTIVE COMMITTEE - Hawthorne V
3:00 PM	NATIONAL MASTITIS COUNCIL BOARD OF DIRECTORS MEETING - Hawthorne V

WEDNESDAY EVENING - AUGUST 10, 1983

6:00 - 7:00 PM	RECEPTION - Hawthorne Ballroom
7:00 - 10:00 PM	ANNUAL AWARDS BANQUET - Hawthorne Ballroom PRESIDING - Robert Marshall, President INVOCATION INTRODUCTIONS PRESENTATION OF AWARDS - William Arledge, Awards Chairman 1. Norman F. Sherman Award, Sponsored by National Institute for the Foodservice Industry 2. Certificate of Merit Awards 3. Honorary Life Membership 4. C.B. Shogren Memorial Award 5. Citation Award 6. Harold Barnum Industry Award, Sponsored by NASCO 8. Educator Award, Sponsored by Milking Machine Manufacturer's Council of the Farm and Industrial Equipment Institute 9. Sanitarian's Award, Sponsored by Klenzade Products, Div. of Economics Laboratories; Wyandotte Corp., Inc.; Monarch Chemicals, Div. of H.B. Fuller INSTALLATION OF OFFICERS Past-President's Award

THURSDAY - AUGUST 11

7:30 AM	IAMFES EXECUTIVE BOARD BREAKFAST MEETING - Senator I

THURSDAY - AUGUST 11

NATIONAL MASTITIS COUNCIL
1983 Summer Meeting Program

See NMC 1983 Summer Meeting Program in June issue of the journals.

ENTERTAINMENT

6:00 - 7:00 PM	Sunday - EARLY BIRD RECEPTION - Pavilion East Foyer
7:00 - 8:00 PM	SLIDE SHOW by Mr. & Mrs. Ivan Parkin
5:30 - 10:30 PM	Tuesday - RALSTON PURINA FARM OUTING
6:00 - 7:00 PM	Wednesday - RECEPTION - Hawthorne Ballroom
7:00 - 10:00 PM	Wednesday - AWARDS BANQUET - Hawthorne Ballroom

SPOUSE'S PROGRAM

MONDAY - AUGUST 8, 1983

1:00 - 3:00 PM	HERITAGE FASHION SHOW... From the Robert Campbell House and Museum collection. 100 years of St. Louis fashions, 1842-1942. THE CALICO-TRUNK...Custom Flower Arranging demonstration by Sue Mueller. Learn to make a bow.

TUESDAY - AUGUST 9, 1983

9:30 AM - 2:30 PM	VISIT THE SUBURBS OF ST. LOUIS...depart hotel for a drive to Kirkwood and visit the following:

KIRKWOOD HISTORY HOUSE ...This house tells the whole story of suburban Kirkwood because it is not associated with only a single family but several families that played varied and interesting parts in the history of the community. The home dates back to 1878. Mrs. Saller, the former owner, went to great lengths to make it possible for the historical society to purchase the house in 1972.

LUNCHTIME...next stop will be at the Kitchen Klutter for a session of Lunch and Learn by Claudia. Recipes will be given.

HOFFMAN-WARD HOUSE...the Hoffman-Ward House was built in the period of 1880-1885 by John Hoffman, apparently as a gift to his daughter Elizabeth and her husband Thomas H. Ward. The house now serves eight boutique and craft shops - emphasizing early handcrafts and antiques of fine quality. In May, 1982, the Hoffman-Ward House received an award from the St. Louis County Historic Buildings Commission for "excellence in adaptive reuse" of an historic building.

WEDNESDAY - AUGUST 10, 1983

9:30 AM - 2:30 PM

ONE MAN'S DREAM...Drive through Forest Park, scene of the 1904 World's Fair, and is one of the largest urban parks in the United States. Attractions within the Park are: St. Louis Zoo, Art Museum, McDonnell Planetarium, Municipal Opera, Jewel Box, Bird Cage (large walk-through aviary), and Jefferson Memorial (Missouri Historical Society).

VISIT...
MISSOURI BOTANICAL GARDEN...Comparable only to the Kew Gardens in London after which it was patterned. It contains the largest collection of plant life in the western hemisphere. This is truly a center of beauty and learning. Enter into the gardens by way of the new Ridgeway Center.

Tower Grove House - Henry Shaw's country home, built in 1849, beautifully restored with many of the original furnishings.

Seiwa-en - This Japanese Garden is the largest in the western hemisphere. Each point for viewing is like an individual painting unfolded before your eyes and exciting at every season.

Other attractions within the Garden include the Climatron (first geodesic domed greenhouse of its type in the world), the Desert House, the Meditteranean House, and famous rose gardens.

LUNCHTIME...Museum Building at the Garden.

Ralston Purina Farm Dinner and Entertainment Featured at the 70th IAMFES Annual Meeting in St. Louis, MO

Checkerboard Square located in St. Louis, Missouri is the international headquarters of Ralston Purina Company. The company also maintains an experimental agricultural farm located outside the City of St. Louis. Through the company's hospitality, registrants at the 70th International Association of Milk, Food and Environmental Sanitarians Meeting will have the opportunity to visit the farm, take a short bus tour of the farm with brief stops at the experimental dairy farm and other appropriate locations. This will be followed by a family style country fried chicken dinner and variety show entertainment. Don't miss this one! August 7-11, 1983. Registration form included in this issue.

St. Louis — in the heart of it all

You are invited to attend the 70th Annual Meeting of IAMFES, August 7-11, 1983 at the Marriott Pavillion in beautiful St. Louis, MO. Educational meetings, interminglings with fellow professionals and entertainment has been planned for this yearly event. You'll also enjoy the Ralston Purina Farm outing and dinner. Spouse's entertainment is once again an outstanding attraction. Don't miss it!

ADVANCED REGISTRATION FORM for the 70th IAMFES ANNUAL MEETING
August 7-11, 1983, St. Louis, MO

Mail Meeting Registration Today To:

Vernon R. Cupps
Milk Control Service
St. Louis Health Division
PO Box 14702
St. Louis, MO 63178
314-658-1112

Please check where applicable:

- ☐ Affiliate Delegate
- ☐ Affiliate Member
- ☐ IAMFES Member
- ☐ Past President
- ☐ Executive Board
- ☐ Speaker
- ☐ 30 year Member
- ☐ 50 year Member
- ☐ Non-Member

ADVANCE REGISTER NOW BEFORE JULY 1, 1983 . . . AND SAVE
(refundable prior to June 30 if you don't attend)

Make Checks Payable to . . . IAMFES MEETING FUND

	ADVANCE REGISTRATION				REGISTRATION AT DOOR			
	Member	Spouse of Member	Student	Non Member	Member	Spouse of Member	Student	Non Member
Registration	☐ $30	☐ $10	Free	☐ $40	☐ $35	☐ $12	Free	☐ $45
Ralston Purina Farm Outing and Dinner	☐ $15	☐ $15	☐ $15	☐ $15	☐ $17	☐ $17	☐ $17	☐ $17
Banquet & Cocktail hr.	☐ $15	☐ $15	☐ $15	☐ $15	☐ $17	☐ $17	☐ $17	☐ $17

Name ______________________________

Employer ______________________________

Address ______________________________

City ______________________ State __________ Zip __________

- -

MAIL this bottom section to: Marriott Pavilion, One Broadway, St. Louis, MO 63102, 314-421-1776
IAMFES 70th Annual Meeting August 7-11, 1983

Arrival Date & time ____________________ Departure Date ____________________

Name ____________________ Address ____________________

City ______________________ State __________ Zip __________

*Arrangements have been made for a flat rate of $48 per room with a maximum of 4 people to the room. These rooms will have 2 double beds. $5.00 parking charge per day, includes in and out privileges.

AFFILIATE NEWSLETTER . . .

This page has been devoted to YOU, the IAMFES affiliates. Your input is needed on whether you feel this page should be a regular feature to serve as a communication source between the state and international office. Please respond.

Florida Annual Educational Conference Report

The Florida Association of Milk, Food and Environmental Sanitarians held their Annual Educational Conference March 8 and 9, 1983 at the Quality Inn in Cypress Gardens, Florida. The meeting was exceptionally successful with 105 registered for the meeting sessions and 81 attending the Annual Banquet on March 8. Fourteen papers were presented at the four scientific sessions covering topics of interest to the entire group.

At the banquet the Past President's Certificate was presented to William Isbell and the second Scholarship Award of $500 was given to Maria Rodriquez, a student of the Food Science and Human Nutrition Department at the University of Florida.

The newly elected officers and Board of Directors are:
President: Dr. Ken Smith Dept. Food Science and Human Nutrition, University of FL, Gainesville.
President Elect: James Strange, FL Dept. Agric., Tallahassee
David Fry, Bordens, Orlando
Dan Rader, Superbrand Dairy, Miami
Richard Holtsclaw, FL Dept. Agric., Miami
Richard Jolley, Suncoast Milk Producers Coop, Bradenton
Secretary/Treasurer, Dr. Franklin W. Barber, Ft. Myers

Idaho Environmental Health Association Meeting Highlights

The Idaho Environmental Health Association met March 8-10, 1983 at Boise State University, Boise, ID. The Annual educational conference covered municipal solid waste fired cogeneration energy systems, waterborne outbreaks, legal considerations, plus hot tubs and spas and their regulations.

Awards were given to Stephen Tanner and Jack Jelke. No elections took place this year.

Continuing Education Units. . .if you need CEU's for the annual meeting let us know who to contact. Let us help you strengthen your professional credentials. 515-232-6699 (9-4 weekdays) Kathy Hathaway.

REMEMBER...the membership contest ends July 1, 1983. Let's all pitch in and make the affiliate and international groups grow in number. Do your part.

JFP Abstracts

Abstracts of papers in May Journal of Food Protection
To receive the Journal of Food Protection in its entirety each month call 515-232-6699, ext. A.

Increased Heat Resistance of Salmonellae in Beef with Added Soy Proteins, S. E. Craven and L. C. Blankenship, U.S. Department of Agriculture, ARS, R. B. Russell Agriculture Research Center, P.O. Box 5677, Athens, Georgia 30613

J. Food Prot. 46:380-384

Raw beef inoculated with cells of a composite of five *Salmonella* strains was heated at 54 or 60°C. Survivors were enumerated by plating samples in plate count agar (PCA), XL agar or PCA followed by an XL agar overlay. Best differential recoveries of salmonellae were effected by incubation of PCA plates for 4 h at 37°C followed by overlay with XL agar and incubation for an additional 44 h. D-values of salmonellae at 54 and 60°C were increased significantly when ground beef was supplemented with 30% textured soy protein, soy protein concentrate or isolated soy protein. Increased heat resistance appeared to be caused by an increase in the pH of beef from 5.8-5.9 to 6.1 upon addition of the soy proteins. After adjusting the pH of mixtures of beef and soy proteins with hydrochloric or lactic acid to 5.8 to 5.9, survival of salmonellae to heat was reduced to the level of survival in beef alone. The pH of beef with added structured soy isolate was the same as beef, and heat resistance of salmonellae was not increased in this product. In the pH range 5.9 to 7.1, the maximum heat resistance of salmonellae in beef containing textured soy protein occurred at pH values of 6.5 to 6.8.

Antitumor Activity of Fermented Colostrum and Milk, K. M. Shahani, B. A. Friend and P. J. Bailey, Department of Food Science and Technology, University of Nebraska, Lincoln, Nebraska 68583-0919

J. Food Prot. 46:385-386

Male Swiss mice, implanted with Ehrlich ascites tumor cells, were fed each of the following test materials: fresh bovine colostrum, colostrum cultured with *Lactobacillus acidophilus*, colostrum cultured with *Lactobacillus bulgaricus*, colostrum cultured with *L. bulgaricus* and *Streptococcus thermophilus*, milk cultured with *L. acidophilus* and milk cultured with *L. bulgaricus*. Fresh colostrum had no significant effect when fed ad libitum for 7 consecutive days after tumor implantation. Colostrum fermented with *L. acidophilus, L. bulgaricus* or yogurt culture significantly ($P < 0.05$) inhibited tumor cell proliferation as indicated by a 16 to 40% decrease in cell counts and a 13 to 35% decrease in DNA synthesis. Similar effects were noted for whole milk fermented with either *L. acidophilus* or *L. bulgaricus*.

Microanalytical Quality of Ground and Unground Oregano, Ground Cinnamon and Ground Nutmeg, John S. Gecan, Ruth Bandler, Larry E. Glaze and John C. Atkinson, Division of Microbiology and Division of Mathematics, Food and Drug Administration, Washington, DC 20204

J. Food Prot. 46:387-390

A 3-year national retail market survey was made to determine the sanitary quality of ground and unground oregano, ground nutmeg and ground cinnamon. The official methods of the Association of Official Analytical Chemists were used to count light filth such as insect fragments, rodent hair fragments, feather barbules, mites, aphids and thrips. Insect fragments were the most frequently encountered defect, with count means ranging from 27.9 to 265.7. The percent of samples containing insect fragments ranged from 92.0 to 97.5 for unground and ground oregano, respectively. Other counts ranged as follows: rodent hair fragments, 0 to 703; feather barbules, 0 to 99; mites, 0 to 52; thrips, 0 to 95; aphids, 0 to 209.

ICMSF Methods Studies. XIV. Comparative Study on Recovery of *Salmonella* from Refrigerated Preenrichment and Enrichment Broth Cultures, J.-Y. D'Aoust, H. J. Beckers, M. Boothroyd, A. Mates, C. R. McKee, A. B. Moran, P. Sado, G. E. Spain, W. H. Sperber, P. Vassiliadis, D. E. Wagner and C. Wiberg, Bureau of Microbial Hazards, Health Protection Branch, Health and Welfare Canada, Tunney's Pasture, Ottawa, Ontario, Canada K1A 0L2, Rijksinstituut voor de Volksgezondheid, Antonie van Leeuwenhoeklaan 9, Postbus 1-3720 BA, Bilthoven, Netherlands, Unilever Research, Colworth Laboratory, Colworth House, Sharnbrook, Bedford MK44 1LQ, United Kingdom, Public Health Laboratory, Ministry of Health, P.O. Box 9526, Haifa, Israel, Public Health Service, U.S. Food and Drug Administration, 3032 Bryan Street, Dallas Texas 75204, Food Microbiology Branch, U.S. Department of Agriculture, Beltsville, Maryland 20705, Public Health Service, U.S. Food and Drug Administration, 909 First Avenue, Seattle, Washington 98174, Public Health Laboratory, Hull Royal Infirmary, Anlaby Road, Hull, United Kingdom HU3 2JZ, The Pillsbury Company, Research and Development Laboratories, 311 Second Street Southeast, Minneapolis, Minnesota 55414, Institut Pasteur Hellénique, 127 Av. Vassilissis Sofias, Athènes (618), Grèce, Public Health Service, U.S. Food and Drug Administration, 240 Hennepin Avenue, Minneapolis, Minnesota 55401, and The National Food Administration, Box 622, S-751 26 Uppsala, Sweden

J. Food Prot. 46:391-399

Twelve laboratories from 7 countries compared the productivity of refrigerated (72 h at 5 to 10°C) preenrichment and enrichment broth cultures with a standard cultural procedure for detection of *Salmonella* in 466 naturally contaminated low and high moisture foods. Refrigerated preenrichment and enrichment cultures identified 92.5 and 94.2% of contaminated samples, respectively. Variations in the ability of laboratories to successfully recover salmonellae under refrigeration test conditions were notable. Three laboratories found complete agreement between results by the standard and refrigeration test procedures and 5 additional laboratories reported >90% accuracy; lowest recovery rate for combined refrigeration results was 77%. Sensitivity of the refrigeration techniques was markedly greater with low than high moisture foods where the latter contributed all but two of the 62 false-negative results encountered in this study. Ability of individual laboratories to recover *Salmonella* from refrigerated preenrichment and enrichment broth cultures was not significantly different for given food categories. Productivity of paired enrichment-plating media differed widely with food type. Selective enrichment in tetrathionate brilliant green and plating on bismuth sulfite agar showed greatest sensitivity for isolation of *Salmonella* in high but not in low moisture foods where productivity of the 4 enrichment-plating conditions used in this study was comparable. Results on recoverability of *Salmonella* from refrigerated broth cultures concur with findings of an earlier comparative study and strongly support incorporation of this novel approach in standard cultural methods for detection of *Salmonella* in foods.

Identity of Mesophilic Anaerobic Sporeformers Cultured from Recycled Cannery Cooling Water, Paul J. Thompson and Mary A. Griffith, Gerber Research Center, 445 State Street, Fremont, Michigan 49412

J. Food Prot. 46:400-402

Chlorinated, recycled water for cooling of containers in still retorts was sampled over a 27-month period at one food processing plant. Of 274 samples taken, 28 contained mesophilic, anaerobic spores in numbers that ranged from 0.04-4.6/ml (MPN). Though all isolates were characterized as *Clostridium* species, 11% could not be matched with named species. *Clostridium butyricum* and *Clostridium barati* (synonyms: *C. paraperfringens, C. perenne*) comprised 55% of isolates. Excepting *Clostridium sticklandii,* which is neither proteolytic nor saccharolytic, all isolates were saccharolytic. This contrasted with the finding of both proteolytic and saccharolytic clostridial spores in the municipal water feeding the recycle water reservoir. An apparent selection for saccharolytic strains could not be explained on the basis of published resistance of anaerobic spores to free available chlorine.

Characteristics of the Inhibition of *Brochothrix thermosphacta* by *Lactobacillus brevis,* D. L. Collins-Thompson, D. S. Wood and T. J. Beveridge, Departments of Environmental Biology and Microbiology, University of Guelph, Guelph, Ontario, Canada N1G 2W1

J. Food Prot. 46:403-407

When cultures of *Brochothrix thermosphacta* and *Lactobacillus brevis* were grown together or separated by a dialysis membrane (M.W. cut off = 3,500 daltons), the growth of *Brochothrix* was inhibited. This phenomena occurred under both aerobic and anaerobic conditions and was unaffected by the presence of catalase (412 units/ml). The antagonism appeared to be pH-mediated since it depended on glucose concentration, but low pH (4.5) alone did not directly affect the viability or salt tolerance of singular cultures of *B. thermosphacta*. Electron microscopy of thin sections of *B. thermosphacta* after 24 to 48 h of exposure to *L. brevis* revealed distinct lesions within the peripheral cell wall fabric. These were not seen in control cells of the same age or in cells exposed to 0.01 to 0.1 M acetic acid. Induction of autolysis in *B. thermosphacta* by cell wall metabolism imbalance was believed to be the cause of the growth inhibition.

Fate of *Bacillus cereus* in Whipped Potatoes During Pre-Service Holding as Could Occur in a Conventional Foodservice System, P. O. Snyder, M. E. Matthews and E. H. Marth, Department of Food Science, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 46:408-411

Dehydrated potatoes were reconstituted (50 1/2-cup servings), mixed, transferred to a pan and the surface was inoculated with spores of *Bacillus cereus* to give ≥40 colony forming units (CFU) per 20.3 cm^2. Survival of the organism was determined following pre-service holding, (52°C; 32% relative humidity; 1 h) as could occur in a conventional foodservice system. No statistically significant differences were found in numbers of *B. cereus* before and after pre-service holding. Although the mean surface temperature (56°C) of whipped potatoes was below the maximum germination temperature of *B. cereus* (59°C), mean internal temperature (63°C) and surface temperature (56°C) of whipped potatoes were never low enough for growth of vegetative cells to occur.

Growth and Survival of *Staphylococcus aureus* in Egyptian Domiati Cheese, Ahmed A-H. Ahmed, Moustafa K. Moustafa and Elmer H. Marth, Department of Food Science and the Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 46:412-415

Domiati cheese was prepared from unsalted raw milk and from raw milk with 5 or 10% added sodium chloride. Milks were inoculated with enterotoxigenic *Staphylococcus aureus* strain 100 (produces enterotoxin A) before addition of salt and rennet. Cheeses were stored in whey containing 15% sodium chloride; were held at 30°C and were examined periodically for *S. aureus* count, aerobic plate count, DNase and moisture and salt contents. Numbers of *S. aureus* increased rapidly during preparation of cheese. There was a rapid decrease in number of viable *S. aureus* during storage of cheese made from unsalted milk and cheese made from milk with 5% added salt. In cheese from milk with 10% added salt, *S. aureus* survived until the fourth week. An increase in salt content and a decrease in the pH value of all cheeses occurred during storage in salted whey. DNase was detected only in cheese made from salted milk, but these samples did not contain a detectable amount of staphylococcal enterotoxin either after cheeses were made or after they were stored for 1 week.

Effect of Pasteurization Temperature on Susceptibility of Milk to Light-Induced Flavor, R. Bassette, D. Y. C. Fung and H. Roberts, Department of·Animal Sciences and Industry, Kansas State University, Manhattan, Kansas 66506

J. Food Prot. 46:416-419

Milk pasteurized at 73, 80 and 90°C for 16.2 s and homogenized than exposed to 50-foot-candle intensity of fluorescent light in clear glass bottles was compared for flavor and concentrations of acetaldehyde, propanal, n-pentanal and n-hexanal with similarly treated milk in foil-covered glass bottles. Flavor (hedonic scaling by five judges) was influenced by pasteurization temperatures, storage time and exposure to light. Milk pasteurized at 73°C and held in foil-covered bottles through 10 d at 2°C had the most acceptable flavor. However, when milk was pasteurized at this temperature but exposed to light, it had the least desirable flavor during 10 d. At 14 d, flavor score of the 73°C, unexposed milk declined, and that of the irradiated milk increased so that both were almost identical. At pasteurization temperatures of 80 and 90°C, the adverse effect of irradiation was either reduced or eliminated and the incidence of oxidized flavor lessened. Poorer flavor at these pasteurization temperatures from unexposed milks reflected greater intensities of cooked flavor.

Concentrations of acetaldehyde, propanal, n-pentanal and n-hexanal increased much more in the light-treated samples than those kept in the dark. However, high-heat treatment (90°C) lessened those increases in propanal and n-hexanal but enhanced increases in acetaldehyde and n-pentanal.

Acetoin and Diacetyl Production by Homo- and Heterofermentative Lactic Acid Bacteria, S. M. El-Gendy, H. Abdel-Galil, Y. Shahin and F. Z. Hegazi, Department of Food Science, University of Assiut, Assiut, Egypt

J. Food Prot. 46:420-425

Eleven strains of homofermentative and heterofermentative lactic acid bacteria were screened for acetoin (A) and diacetyl (D) production from pyruvate and citrate in a peptone-yeast extract-glucose broth. The homofermenters, except *Streptococcus faecalis* subsp. *liquefaciens*, produced much more AD from pyruvate than from citrate; the opposite was true for the heterofermenters. Acetoin and diacetyl were produced from pyruvate as soon as growth was initiated. The production was exponential up to 24 h. Destruction of the accumulated AD coincided with entry into the stationary phase. Production of AD from citrate did not begin until 6 h of the logarithmic phase of growth. Formation of gas from citrate by *Lactobacillus plantarum* did not implicate greater ability to form AD from citrate than from pyruvate. Fifty μmoles ml^{-1} citrate caused about 50% inhibition of growth of *Streptococcus lactis* subsp. *diacetylactis*. All strains examined for ability to use pyruvate as a sole source of carbon were able to do so. Acetate (50 μmoles ml^{-1} generally stimulated AD formation from pyruvate. With the exception of a *Pediococcus* sp. and *S. faecalis* subsp. *liquefaciens*, acetaldehyde (100 μg ml^{-1}) enhanced AD production but not growth. Concentrations higher than 100 μg ml^{-1} had different effects.

Assessment of Cooked Prawns as a Vehicle for Transmission of Viral Disease, M. J. Eyles, Department of Veterinary Pathology, University of Sydney, NSW 2006, Australia

J. Food Prot. 46:426-428

A method has been developed for recovery of viruses from cooked peeled prawns. The method involves elution of viruses from the surface of prawns using a suitable buffer, clarification of the extract by centrifugation and concentration of viruses present by ultracentrifugation. In trials with laboratory-contaminated samples of prawns the method recovered at least 70% of added poliovirus 1. The survival of poliovirus 1 on the surface of cooked peeled prawns was followed during storage at 4-6°C and -20°C for up to 15 d and up to 300 d, respectively. A substantial proportion (22-75%) of added virus remained infective for the periods that this product is usually stored either during transport and distribution or in the home. Thirty retail samples of cooked peeled prawns were examined for presence of viruses infective for man. Viruses were not isolated from any sample

Characteristics of Salt-Tolerant Lactic Acid Bacteria, in Particular Lactobacilli, Leuconostocs and Pediococci, Isolated from Salted Raw Milk, S. M. El-Gendy, H. Abdel-Galil, Y. Shahin and F. Z. Hegazi, Department of Food Science, University of Assiut, Assiut, Egypt

J. Food Prot. 46:429-433

One hundred and fourty five lactobacilli, leuconostocs and pediococci were isolated from salted raw milks incubated at 30°C for 4 to 21 d. Of 126 lactobacilli isolated, mostly from 9 to 12% salted milk, 115 were identified as homofermentative, nonthermophilic lactobacilli-73 were classified as *Lactobacillus plantarum*, 31 *Lactobacillus casei*, 8 strains were motile and 3 *Lactobacillus xylosus*. The remaining 11 isolates were heterofermentative lactobacilli-8 were *Lactobacillus cellobiosus* and 3 *Lactobacillus brevis-buchneri*. Strains of *L. plantarum* fermented many oligosaccharides, produced DL lactate and gas from L(+) but not from D(−) tartrate and their cell wall peptidoglycan was of the mesodiaminopimelic acid type. Eight strains of *L. casei* proved to be subsp. *pseudoplantarum* on the basis of inactive lactic acid production; 8 were subsp. *rhamnosus* and 2 subsp. *alactosus*, according to their pattern of sugar fermentation. *L. xylosus* simulated *L. casei* morphologically but differed from it in fermentation of xylose. The motile strains fermented arabinose and mostly sucrose but not lactose and produced 73.2 to 94 μmoles ml^{-1} inactive lactate from 1% glucose. None of 10 *Leuconostoc* isolates produced dextran from sucrose but they fermented trehalose and were identified with *Leuconostoc paramesenteroides*. Three strains belonged to *Pediococcus* and produced 62 μmoles ml^{-1} of inactive lactate, whereas other six strains were atypical pediococci. Nineteen strains representing *L. plantarum*, *L. casei*, motile strains and *Pediococcus* gave, on examination for isomers of lactic acid, 32.8 to 171 μmoles ml^{-1} inactive lactate; the L(+) enanthiomorph generally predominated.

Storage Characteristics of Fresh Swordfish Steaks Stored in Carbon Dioxide-Enriched Controlled (Flow-Through) Atmospheres, V. Oberlender, M. O. Hanna, R. Miget, C. Vanderzant, and G. Finne, Seafood Technology Section, Department of Animal Science, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas 77840 and Texas Agricultural Experiment Station, Agricultural Research and Experiment Center, Texas A&M Univeristy, Corpus Christi, Texas 78410

J. Food Prot. 46:434-440

A flow-through controlled atmosphere packaging system using a number of different carbon dioxide-enriched gaseous compositions was demonstrated to be effective in retarding the growth of microorganisms on fresh swordfish steaks held at 2°C for 22 d. During the first 14 d of storage, *Pseudomonas* spp. either dominated or represented a major part of the microflora of steaks in all gaseous atmospheres tested. However, in atmospheres containing 70% CO_2 or in pure CO_2, heterofermentative *Lactobacillus* spp. and *Brochothrix thermosphacta* were a major part of the microflora, particularly after the 14th day of storage. Both total volatile nitrogen and trimethylamine, often used as quality indicators for fresh seafoods, increased more slowly for swordfish steaks stored in CO_2-enriched atmospheres than steaks stored in air. Advantages of using a controlled atmosphere flow-through system for storage of fresh seafoods include: (a) a stable gas composition, (b) individual portions can be removed from a master package without losing or disrupting the gaseous atmosphere, and (c) volatile off-odors which accumulate during storage in sealed CO_2-enriched atmospheres are carried off with the flow-through gas.

Composition and Microbiology of Some Native Alaskan Preserved Foods, Edmund A. Zottola, Mary K. Wagner and Peter T. Zoltai, Department of Food Science and Nutrition, University of Minnesota, St. Paul, Minnesota 55108 and Marguerite Stetson, Cooperative Extension Service, University of Alaska, Fairbanks, Alaska

J. Food Prot. 46:441-443

Ten samples of native Alaskan processed or partially processed fish and fermented whale meat were obtained from three of five native Alaskan villages visited in three different geographical areas of the state. Native Alaskan methods of processing/preserving the fish were observed. Samples were analyzed for composition and microbiologically for anaerobic bacteria. Compositional analysis suggested that the major preservation effect was through the reduction of a_w.

Meat Spoilage and Evaluation of the Potential Storage Life of Fresh Meat, C. O. Gill, Meat Industry Research Institute of New Zealand (Inc), Hamilton, New Zealand

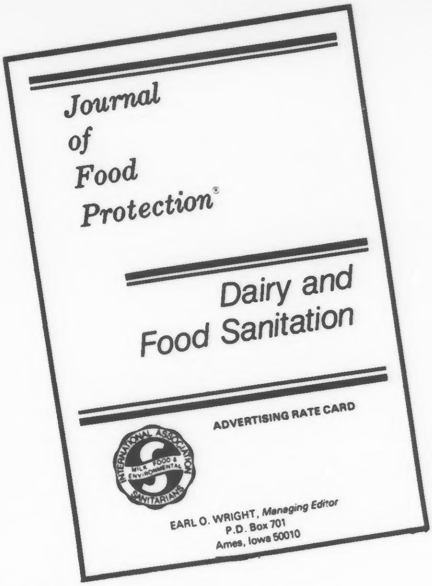
J. Food Prot. 46:444-452

Microbiological processes by which meat develops qualities unacceptable to consumers vary with the composition of the meat and spoilage microflora. Composition of the spoilage microflora is affected by meat composition and storage conditions. Aerobic spoilage microfloras are usually dominated by pseudomonads. With this type of microflora, spoilage occurs when glucose in meat is no longer sufficient for the requirements of the spoilage microflora and the bacteria start to degrade amino acids. When meat is deficient in glucose, spoilage becomes evident while bacterial numbers are relatively small. Anaerobic microfloras are usually dominated by lactobacilli which produce spoilage by the slow accumulation of volatile organic acids. Meat of high utimate pH packaged anaerobically spoils rapidly because the high pH allows anaerobic growth of bacterial species of higher spoilage potential than the lactobacilli. Before overt spoilage develops, the spoilage status of meat can be accurately assessed from the bacterial numbers on meat only when there is assumption or knowledge of meat composition, storage conditions and the types of bacteria present. Methods for estimating spoilage which depend upon detection of products of amino acid degradation have little predictive value as such products will only be present after attack on amino acids has commenced and are irrelevant to spoilage under anaerobic conditions. Estimation of the concentrations of other spoilage products may be the only method applicable to assessment of incipient spoilage of meat stored anaerobically. It is, therefore, unlikely that any single test can give unequivocal information on meat quality under all circumstances, but rapid tests for meat quality could be of value for specific commercial purposes, provided such tests are appropriate to the circumstances and the inherent limitations of any test are recognized.

Determining the Safety of Enzymes Used in Food Processing, M. W. Pariza and E. M. Foster, Food Research Institute, Department of Food Microbiology and Toxicology, University of Wisconsin, Madison, Wisconsin 53706

J. Food Prot. 46:453-468

Enzymes are proteins that catalyze chemical reactions. They are highly specific and needed in only minute quantities. Certain enzymes have long been used to produce specific foods (e.g., cheese). Today they have numerous applications and are increasing in commercial importance. There has never been a health problem traced to the use of an enzyme per se in food processing. However, it is important that scientific data be provided to show that enzyme preparations, particularly those lacking a long history of safe use, are in fact safe to consume. The purpose of this report is to propose guidelines for assessing enzyme safety. We conclude that the enzymes per se now used or likely to be used in the future in food processing are inherently nontoxic. Safety evaluation should focus on possible contaminants which could be present. Assuming that current Good Manufacturing Practices (CGMPs) are followed, toxic contaminants could only come from the enzyme source itself (animal, plant or microbial). Hence, the safety of the source organism should be the prime consideration. Enzymes from animals or plants commonly regarded as food need not be subjected to animal feeding studies. Some food plants produce toxins and chemical assays may be used in these cases to assess safety. For enzymes from bacteria, it should be shown that antibiotics and acute toxins active via the oral route (enterotoxins and certain neurotoxins) are absent. Small molecular weight toxins (< 500 daltons) may be produced by certain fungi and actinomycetes. It should be shown that enzymes from such organisms are free of these materials. If it is established that a microbial culture does not produce antibiotics or toxins active via the oral route, then enzymes manufactured from that culture using CGMPs may be regarded as safe for use in food processing.



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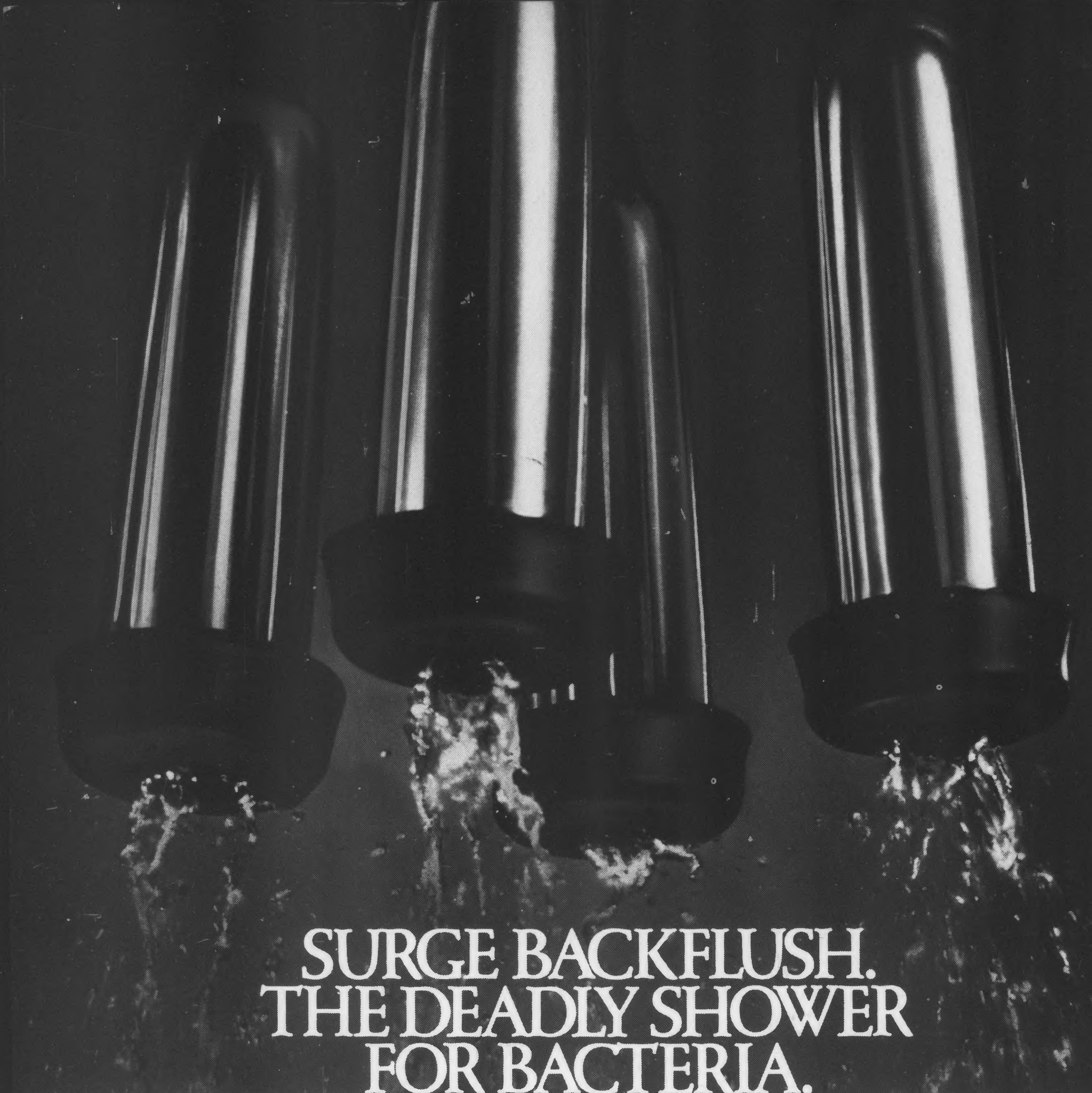

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