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# Dairy and Food Sanitation

*A Publication for Sanitarians and Fieldmen*

- Minimizing Predicted Bacterial Growth in a Commissary Foodservice System Utilizing Quality Assurance Tools
- Measurement and Reduction of Iodine in Milk
- Formulating Microbiological Culture Media-A Careful Balance Between Science and Art

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

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# Dairy and Food Sanitation

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# FORMULATING MICROBIOLOGICAL CULTURE MEDIA - A CAREFUL BALANCE BETWEEN SCIENCE AND ART

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*The manufacture of dehydrated microbiological culture media involves the technical skills and training of a microbiologist and a biochemist, together with a bit of alchemy. Microbiological culture media are composed of numerous chemically and non-chemically defined constituents in order to provide microorganisms with nutrients for proper growth and reproduction. Non-chemically defined components make it necessary to develop some of the alchemist art yet at the same time adhere to scientific principles. The main components of culture media that will have a direct effect on productivity and quality of the media are 1) chemically defined ingredients; 2) non-chemically defined ingredients; 3) selective agents; 4) dyes and indicators; and 5) solidifying agents. The careful balance of these components must assure that the phsyical and biological performance of microbial media are reproducible from batch to batch.*

The manufacture of dehydrated microbiological culture media involves not only the technical skills and training of a microbiologist and chemist, but also some of the art applicable to an alchemist. Microbiological culture media are composed of numerous chemically and non-chemically defined constituents which makes it necessary to develop that art while at the same time adhering to scientific principles. The main components of culture media can be separated into five groups. These five groups include: chemically defined ingredients, non-chemically defined ingredients, selective agents, dyes and indicators and solidifying agents or agars. The presence and careful balance of these ingredients in media determine the functionality of the media. Depending on the functional properties of the media, media can be classified as: general purpose, enrichment, assay, selective and/or differential.

Each main component will be discussed further.

*Chemically Defined Ingredients.*

The first group consists of chemically defined ingredients which serve a variety of purposes in the completed media. Briefly, some uses of these components, and examples of each are: buffering agents (Sodium or Potassium Chloride), carbohydrates for fermentation and energy sources (Lactose, Sucrose, Glucose) and amino acids for decarboxylase reactions or to supplement growth requirements (Lysine, Ornithine). Chemically defined ingredients are generally included for reasons specific to each culture medium (make medium selective or differential) and in most cases, USP, NRC or Reagent grade chemicals are used in the manufacture of the final product. In all instances, anhydrous, or when necessary due to the nature of the chemical, monohydrate forms are used. This is usually done in order to maintain a low moisture content and prevent degradation of the components while at the same time ensuring that the powder flows freely.

*Non-chemically Defined Ingredients.*

The second category of components includes peptones, infusions and extracts, or any other non-chemically defined ingredient which may serve as an amino acid, a nitrogen or an energy source for microorganisms. Sources for these ingredients are both plant and animal tissues. Major peptone sources are casein from milk and enzymatically hydrolyzed (digested) meat which are readily available organic nitrogen sources for most bacteria. Peptones may be defined as mixtures of polypeptides, oligopeptides, amino acids, organic nitrogen bases, salts and trace elements and are added to most media in order to enhance the nutritional quality of the media.

One of the major problems encountered in the manufacture of microbiological culture media arises from the fact that peptones are not chemically defined, and standards have not been established concerning the level of trace elements or other substances which should be present to ensure adequate levels of growth factors. Peptone quality is assessed by the ability of the peptone to support adequate growth of various microorganisms when incorporated into the medium. The nature of the peptones will then play a major role in the growth performance properties of the medium.

The amount and variety of growth factors required by the different groups of bacteria are so great that controlling only a few of those factors may be misleading. The proportions of the various factors required by the different microorganisms may vary so much that it is unlikely that an individual peptone will meet the complete requirements of a large number of bacteria. Also, there may be more important growth factors which are, as yet, unknown and which may play a significant role in bacterial metabolism. It should not be overlooked that inhibitory substances may remain undetected and adversely influence the results of tests.

In order to assess non-chemically defined components, such as peptones, a criterion that has been introduced into the standard testing procedure, that is "performance testing." It is necessary, in this case, to determine how a particular batch of a peptone performs when incorporated into a complete medium. It is also important to compare a "control" or known standard peptone with the material under evaluation. This procedure is necessary when working with any non-chemically defined material, and it enables the laboratory to control any biological variations which may occur. (Discussed in detail in a later section).

*Selective Agents.*

Inhibitory agents such as bile, bile derivatives, antibiotics, drugs, and specialized chemicals are incorporated into the formulation to produce media which are selective for specific microorganisms. Most bile-containing media are designed to suppress Gram-positive organisms although some bile salts will allow staphylococci and streptococci to grow. Bile products are known under various names, such as Oxgall, Bacteriological Bile, Bile Salts, Bile Salts No. 3, etc. The variations between batches and suppliers of these products can create considerable problems in the production of media such as MacConkey Agar, SS Agar, and Violet Red Bile Agar. Bile products are quite often unacceptable due to their tendency to precipitate or leave "scums" on the surface of solid media.

Antibiotics are routinely used as selective agents in culture media. The criteria for their use are as follows: 1) Stability; 2) Solubility; 3) A high specific antimicrobial spectrum; 4) Freedom from toxicity for the organisms being selected.

Antibiotics, such as colistin and naladixic acid, which are stable and can withstand temperatures associated with the autoclave are added to the culture medium in its dehydrated state whereas less stable antibiotics (penicillin and streptomycin) are added after the medium has been sterilized and the temperature reduced to less than 50 C. By choosing the correct antibiotics at appropriate concentrations, it is possible to construct selective media and at the same time provide a tentative identification of the pathogen or organisms under investigation. Thayer-Martin medium, used to isolate *Neisseria gonorrhoeae* is an excellent example of this approach. Vancomycin, colistin and nystatin inhibit the growth of most Gram-negative and all Gram-positive organisms plus yeast. Occaisonal overgrowth and swarming of species of *Proteus* have been overcome by the addition of trimethoprim. With the use of antibiotics, it has become possible to design an endless variety of selective culture media to facilitate the isolation of bacteria from heavily contaminated samples.

Prior to the widespread use of antibiotics and other drugs, certain chemicals or dyes have been used as selective agents. Sodium azide and phenylethyl alcohol were incorporated to make blood agar media selective for the growth of certain bacteria. More recently, blood bases have been developed which use antibiotics instead of chemical agents to produce selective media. Examples would be Columbia CNA and Selective Streptococcus Agar.

*Dyes and Indicators.*

Dyes and indicators play an important role as constituents in culture media. A major problem in the use of dyes for bacteriological purposes is that the dyestuff industry produces compounds with properties which vary considerably. Examples of dyes used extensively in microbiological culture media are basic fuchsin (Endo Agar), gentian (crystal) violet (MacConkey Agar) and methylene blue (EMB Agar).

Fung and Miller screened 30 species of bacteria against 42 dyes at different concentrations in order to test their inhibitory and differential properties. They showed that Gram-negative organisms have greater resistance to dyes than

Gram-positive organisms, and that alkaline base dyes were more inhibitory than acidic or neutral dyes at the same concentration.

Indicators are used extensively in media in order to show pH and redox changes created by reactions, such as fermentation. Bromocresol purple, phenol red, and bromothymol blue are some of the commonly used indicators. Resazurin and methylene blue are examples of compounds used for observing redox changes. When incorporating indicators into media, the pH of the medium itself becomes extremely important since the initial color of the medium prior to inoculation will be affected by an incorrect pH. Weak positive reactions may be difficult to interpret if the pH of the uninoculated original medium causes a color very similar to a weakly positive reaction, such as Phenol Red Agar at pH 7.0.

*Solidifying Agents*

The fifth group of components consists of the solidifying agents, which in most cases is agar. However, synthetic agar substitutes are currently being evaluated by the industry. Agar is a complex mixture of polysaccharides extracted from species of the red algae that are known as agarophytes and named *Gelidium, Gracilaria, Pterocladia, Acanthopeltic* and *Ahnfeltia*.

Agar not only varies according to the source of the seaweed, but also according to the method of manufacture. The effect of extraction temperature, time and pH, the clarification and bleaching processes used, the conditons under which the gel is frozen or pressed to remove water, and the subsequent drying and milling are all important. Bacteriological agar should be insoluble in cold water, but soluble in hot (boiling) water and should have a temperature between 40 C and 44 C at which gelling occurs. Agar may be used to grow thermophilic organisms which require incubation at temperatures up to 75 C since agar will remain as a gel until the temperature reached 80 C. Agar may also be used in poured plates for counting bacteria from water, soil, milk, etc., and heat sensitive components such as blood may be added to it provided the temperature of the agar is above 39 C and below 50 C.

Gel strength and clarity are two important characteristics of agars used in culture media. Agar will normally form a firm gel at concentrations varying from 0.9% w/v to 1.6% w/v. Culture media normally include the agar concentration at a prescribed number of grams per liter when in fact it may be necessary to increase or decrease the concentration in order to obtain similar strengths of gel from batch to batch.

Ideally, molten agar should be clear, without a deposit, and produce an almost transparent appearance when poured to a depth of 4 mm and allowed to set. Hazy appearance in agars can be caused by mineral incompatibilities or debris which may have passed through the filters during the manufacturing process. Heavy metals and fatty acids have both been cited as possible toxic agents in agar.

*Quality Assurance of Raw Materials.*

The manufacture of microbiological culture media, using the above groups of components, is a task which requires testing at various stages to ensure a satisfactory product. Testing of all non-chemically defined components prior to purchase is necessary even if the material is obtained from a recognized and reliable source. Certain physical and chemical tests are carried out but the ultimate criterion is always how the material performs when incorporated into a standard medium. A nonchemically defined material under investigation is tested as the only variable component in a controlled experiment. For example, a soy peptone under test would be used in the formulation for Tryptic Soy Broth where the other ingredients, casein peptone, dextrose, sodium chloride and dipotassium phosphate, would be from the same batches of material incorporated in the control medium. The batch of soy peptone used in the control medium would be from a batch previously found to be satisfactory. This method ensures that the material under investigation will perform according to biological specifications when combined with other components to produce a complete medium. It is not uncommon for a raw material to pass most chemical and physical tests but not perform correctly when incorporated into a complete medium, or to produce undesirable effects, such as precipitation

Screening of raw materials by the above mentioned method eliminates most of the problems which can arise when manufacturing culture media. However, problems do occur occasionally, even with "approved" raw materials and it is therefore necessary to produce a trial batch by using specific combinations of raw materials before final manufacture is contemplated. This procedure enables one to check against possible problems due to interaction between the ingredients. In most instances, incompatibility gives rise to precipitation, opalescence, changes in color, decrease in the strength of the gel, separation of high and low density fractions and poor growth response which indicate chemical and physical changes within the medium.

One of the most common causes of precipitation in media following heating for sterilization is the reaction between di- and tri-valent metals and soluble phosphates. The metals are present in the media as impurities in other reagents whereas the phosphates are released from peptone and meat and yeast extracts. Excessive and prolonged heating create the conditions for precipitation. Calcium and magnesium precipitate as carbonates as a result of bicarbonate buffer breaking down in a medium. In these circumstances, it is necessary to ensure that the containers are tightly closed to prevent the loss of carbon dioxide.

Alkaline earth metals react with bile salts to form insoluble complexes and in some circumstances precipitation is intended when a soluble bismuth salt reacts with sodium sulphite for the identification of salmonellae.

The failure of "approved" raw materials to give acceptable results when incorporated into complete media is one of the hazards of working with non-chemically defined materials.

Standard or "Master" formulations for culture media lend themselves to modification, on occasion, due to the non-chemically defined ingredients. The most common adjustment to any formulation is the concentration of agar, since the gel strength of agar can vary greatly, depending upon the country of origin. The establishment of ranges of gel strength for various media enables the manufacturer to vary the concentration of agar so that the gel strength falls within the prescribed range established by testing the product at various gel strengths, and also the need to ensure the medium is firm enough to be inoculated. When the ranges are established, adherence to them assists in keeping variations from batch to batch of a specific product at a minimum. In addition to agar, other constituents may periodically require slight changes of concentration in order to ensure new batches perform similar to previous batches. Dyes and indicators may vary in purity and intensity of color between batches and manufacturers making it necessary for more or less dye or indicator to reproduce acceptable color standards. Control batches of media play an important role in keeping colors as well as variations in gel strength at a minimum.

*Summary.*

Working with non-chemically defined materials presents many challenges. A few of the problems which may occur have been described, but it is impossible to discuss all of the situations which may occur when working with culture media. The factors which are considered most important in the manufacture of these products are that both the physical characteristics and biological performance are reproducible from batch to batch. In order to achieve these conditions, the "art" of manufacturing microbiological culture media is often as important as the science.

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# Quality Assurance of Microbiological Culture Media

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*Quality assurance of commercially or laboratory prepared culture media is essential to insure accuracy, reliability, and reproducibility of performance in the isolation and identification of pathogens, contaminants and/or spoilage microorganisms. Sometimes it is time-consuming, tedious, expensive, but it is an essential ingredient for the productivity of the microbiology laboratory. Specific quality control methods that have a direct impact in the productivity of microbiology laboratories include: media, reagents, antisear, antibiotics, equipment, stock cultures, and personnel. This paper will only focus on the factors influencing the use and results of microbiological media and suggest pertinent methods to set-up and maintain the quality of microbiological media.*

In the previous article Alvarez and Nichols discussed the manufacture of dehydrated culture media. Making microbial media involved the technical skills and training of a microbiologist and a biochemist, together with a bit of alchemy. The paper also describes the main components of culture media that will have a direct impact on the productivity and the quality of the microbiological media. However, even though this paper will concentrate on media, the reader must be aware that a complete quality assurance program in the laboratory is essential. Table 1 shows specific areas and methods of quality control which have a direct impact in the productivity of microbiology laboratories.

A quality control program must be defined on two levels. In manufacturing, quality control is part of quality assurance. QC management has the responsibility to confirm that a given manufacturing procedure, ingredient, component, or finished product lot complies with the standards established by the quality assurance program. In the user's laboratory, quality control management has the responsibility to establish by performance testing that the product, once in the laboratory, is appropriate for use in a routine clinical or commercial testing procedure. In both instances, the primary function of the quality control program is to establish the efficacy of the finished product.

The costs and risks associated with a mis-manufactured lot of media far outweigh the costs associated with a quality assurance program. Inferior products do not enhance the manufacturer's image, reputation, or sales in a competitive and professionally oriented market.

Microbiological media can be prepared in the laboratory (Dri-Form) or it can be purchased ready to use from a media manufacturer (Pre-Form). Even though the commercial media manufacturers do extensive testing, the microbiology laboratory should perform their own quality control to insure that the media is reliable and changes have not occurred since the date of production. Quality control is necessary to assure the laboratory technician of the productivity of the media.

A product may be of the highest quality when shipped from the producer, but due to adverse shipping and storage conditions and incorrect usage, its efficacy can be severely jeopardized. While dry-powder media in use in today's microbiological laboratory conform for the most part to stated formulas, they often contain peptones, agar, meat extracts, yeast extracts, and other materials of biological origin that are rather undefined as to their chemical or physical components. Hence, even though the manufacturer may purchase and use ingredients of the highest quality, the source of the material and the manner in which it was processed may account for lot-to-lot variations in the media's ability to support microbial growth or to produce exact reproducible lot-

TABLE 1. *Specific areas and methods of quality control which have a direct impact in the productivity of microbiology labor - atories.*

| | |
|---|---|
| 1. Media | a) prepared in laboratory (dri-form) |
| | b) purchased ready for use (pre-form) |
| | c) sterility testing |
| | d) enrichments |
| 2. Reagents | a) stains |
| | b) chemicals |
| 3. Antisera | a) for typing |
| | b) for groupings |
| 4. Antibiotics | a) powders |
| | b) antibiotic disks |
| 5. Equipment | a) autoclaves |
| | b) incubators |
| | c) biological hoods |
| | d) etc. |
| 6. Stock Cultures | a) transfer |
| | b) replacement |
| 7. Personnel | a) manuals |
| | b) training |

to-lot performance results. This problem can be compounded by inferior reagents, incorrectly standardized equipment, or stock cultures that have been carried in vitro for an extended period of time, resulting in genetic and/or physiological changes in their normally expressed biochemical patterns.

One of the most frequent causes of faulty media is the user's failure to read the manufacturer's product information pertaining to such matters as storage and rehydration. This can result in improper weighing, oversterilization, improper pH adjustments, etc. Storage of a given dry-power medium depends upon its ingredients, but as a general rule of thumb, dry-powder media should be stored in a cool, dry place at 15-30 C. Since most dry-powder media are hygroscopic, they should be tightly stoppered to prevent absorption of moisture that may result in subsequent caking and degradation of ingredients. They should never be exposed to direct sunlight, ultraviolet rays, or other highly energized light sources.

Media preparation or purchase should be timed so that any required quality control testing can be done before new lots are put into use. All batches should be dated and logged as to constituents, time of preparation, etc. All media, including dehyrated media (Dri-Form), should be stored according to manufacturer's specifications. Barlett's guidelines for storage and shelf life of dehydrated media can also be followed.

Sterility tests must be made on all batches of plated media and on tubed media which are prepared with the addition of one or more sterile components (e.g., sugars or heat-labile enrichments) after sterilization. A representative portion of each new lot should be incubated overnight at 35 C, or other temperatures at which the medium is to be used, to check the sterility before use. Scattered surface contamination of plates may not be detected on controls but should be recognized during diagnostic work, often by the observation of growth of a particular colonial type part way through a streaked population. Selective media, because they are inhibitory to many organisms, pose special problems. Even gross contamination may not be detected by the methods described above. Consequently, the microbiology laboratory must continually evaluate selective media to assure their performance and productivity. Also, in the case of enriched media, selective media, or differential media, adjuvants -- CVA, blood, carbohydrate substrates, etc. -- that have been improperly or carelessly added are often the cause of faulty media.

Cosmetic appearance of the media is of importance to the final performance. When a new batch of Pre-Form medium is prepared or received it should first be examined visually for clarity, color and homogeneity. Unless the medium contains an insoluble component, the presence of turbidity or precipitate indicates that a constituent has come out of solution. Dri-Form or dehydrated media should be examined for homogeneity, power consistency, color and odor.

Incorrect weighing at the point of rehydration can be a major source of error. While it is good laboratory practice to verify the performance of a balance immediately prior to use, this step is often considered too cumbersome or bothersome to be performed on a daily basis. The errors in rehydration are often compounded by use of water with detrimental cation or anion levels, improper heating of the rehydrated ingredients into complete solution, and detrimental hydrolysis caused by overheating.

One of the most common problems observed in the laboratory is the failure to take adequate steps against loss of water in hydration. Dehydration should not be a problem with liquid or re-hydrated solid media kept in well-sealed, screw-capped containers, but is particularly liable to occur with storage of plated media. Media that show obvious signs of dehydration (cracked or "crazed" surface or separation from the edge of the dish) must be discarded; however, a lesser degree of dehydration can also be harmful. Dehydration can be avoided by sealing convenient numbers of plates in plastic film or plastic bags as soon after pouring as possible. The packaged plates are then stored in the refrigerator. Plates should be removed from storage not more than 2 hrs before use and brought to room temperature before inoculation.

Controls on the growth-supporting, differential, and/or selective qualities of each new lot of medium should be run before use with stable stock cultures of known characteristics.

A log should be kept of all media tested, including the date tested, control or lot number, results of testing, and the name of the person doing the testing. The logs should be easily available to the laboratory staff so that any questions arising about a particular lot of medium can be answered.

Listed below are some frequently encountered problems with microbiological media and their possible causes:

*Decreased gel strength*. Oversterilization, incomplete solution of agar, hydrolysis of agar due to improper pH adjustments, prolonged holding of melted agar media at high temperature, or repeated remelting.

*Increased gel strength (hard medium)*. Improper weighing of ingredients, addition of a high-gel-strength agar, or excessive water loss during sterilization.

*Dark coloration*. Carmelization of sugars and/or peptones caused by oversterilization, burning or charring of media due to inadequate agitation or localized areas of superheating, or inadvertent use of incorrectly formulated or stored adjuvants (hemolyzed blood, drugs, etc.).

*Formation of precipitates*. Oversterilization, prolonged holding of melted agar media at high temperatures, chemical incompatibility of ingredients, rapid cooling, or failure to remove calcium or phosphate ions from water used in rehydration.

*Improper pH*. Oversterilization, improper pH adjustments, incomplete mixing, use of improperly cleaned glassware, use of glassware made of glass with a high soda-lime content (especially true of stock solutions stored in such glassware for extended periods), or repeated remelting.

*Loss of growth-promoting capacity*. Oversterilization, contamination of media with heavy metals due to improperly cleaned glassware or weighing utensils, incorrect osmolarity due to improper pH adjustments, precipitation of ingredients, or repeated remelting of agar medium.

The quality assurance/quality control of microbiological culture media is the surveillance of all the necessary steps and procedures to ensure that the established performance and cosmetic standards are met. This surveillance is conducted through consistent record keeping and reviews aimed at prevention of, rather than detection of, error. The using laboratory must, by the use of complete quality control programs, ensure that accurate, reliable and reproducible test results can be obtained when using microbiological culture and media.

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# MINIMIZING PREDICTED BACTERIAL GROWTH IN A COMMISSARY FOODSERVICE SYSTEM UTILIZING QUALITY ASSURANCE TOOLS

**R. F. CICHY* and R. C. NICHOLAS****

The thrust of this research was an analytical and comprehensive investigation of ground beef patty production in a commissary foodservice system. The data for the study was obtained from a commissary foodservice system which reported a sales volume in excess of $125 million in 1980 (1). The commissary annually ships over 1,500 tons of ground beef and more than two million tons of fresh beef to over 100 restaurants. All of the restaurants are low to moderately priced full-menu, table-service, family restaurants located in the Midwest.

Several quality assurance/quality control (QA/QC) tools were used to evaluate the effectiveness of this firm's total quality system. The Hazard Analysis Critical Control Point (HACCP) procedure revealed time-temperature deficiencies in the system and pointed the way toward corrective action.

The time-temperature relationship is based on a temperature range identified as the temperature danger zone, covering the range of 45° to 140°F (2). Improper supervision of time-temperature relationship has resulted in several outbreaks of foodborne illnesses (3). Establishment of time-temperature standards is a practical method for monitoring entree production in foodservice systems (4). The effect of improper temperatures on the predicted growth rate of bacteria can be determined if average environmental temperatures are known.

## MATERIALS AND METHODS

Due to the preventive nature of HACCP, the foodservice system was examined for both the actual presence, and the possibility for, unacceptable time-temperature combinations. A process flow diagram (see Figure 1) was developed as a vehicle for visualizing the sequence of producing the product and identifying associated hazards. All operations or process steps performed on the principal ingredient (beef) are shown as boxes connected by arrows which indicate the product flow. Items appearing to the left of the operations signify the addition

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of ingredients or supplies. Items appearing to the right of the operations represent either waste or the tests and inspection presently performed on the product at that step. Operations beginning with purchase through assemble/load take place in the commissary. The products are then transported to the individual restaurants aboard company-owned trucks. After transport, the remaining operations in the process flow diagram occur in the restaurant.

Nineteen time-temperature critical control points were identified based on the process flow diagram of the product in the commissary and the restaurants. Because of the nature of a commissary foodservice system, the critical control points are not all under one roof. The observed average temperatures and estimated maximum times are listed in Table 1. Environmental temperatures were measured with a Pacific Transducer Corporation Model Number 615 Portable Dry Stylus Recording Thermometer. Critical control points number 11, 12, 13, 14, 15, 16 and 17 represent temperature variations in the environment. The remaining temperature variations were internal product temperatures measured with a Dahl Digital Platinum - RTD Heat Prober Thermometer Model Number 350X.

Maximum holding times, the other component of the time-temperature relationship, were determined from commissary records and interviews with both restaurant and commissary personnel. The average temperature history of the product revealed that it was likely to be in the temperature danger zone during two of the critical control points: transport and serve. The transportation of the patties took as long as 12 hours from the time the product left the commissary until it arrived at the restaurant. Product environmental temperatures ranged from 39°F to a high of 50°F with an average temperature of 46°F. Product internal temperatures during the "serve" critical control point averaged 119.2°F. This problem was not major because the time involved was no more than 5 minutes. In addition, many of the heat-labile non-spore forming pathogens will be destroyed during the cooking operation.

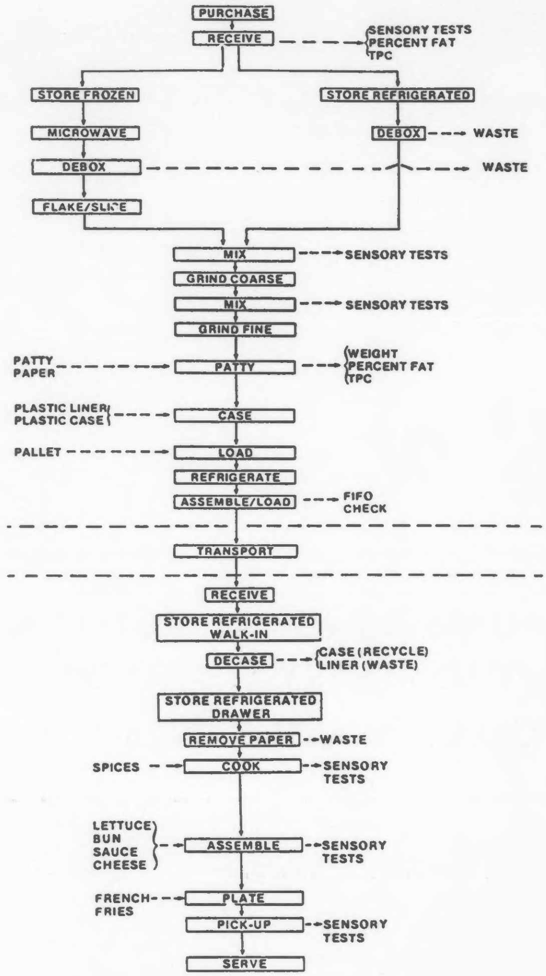


Figure 1. *Complete process flow diagram for ground beef patty sandwich production.*

## DISCUSSION

Further analysis of the critical control points in Table 1 reveals that 5 critical control points are of primary importance: assemble/load; transport; place in refrigerated walk-in; store, walk-in; and store, refrigerated drawer. Variations in these 5 primary critical control points can substantially affect the predicted growth rate of bacteria. Table 2 lists the effect on the predicted growth rate of representative pseudomonas spp. if 1) the bacteria were subjected to the average environmental temperature for the maximum period and if 2) the bacteria were subjected to a temperature that is the observed average plus three standard deviations.

The predicted growth rate of representative pseudomonas spp. is based on a generation time of 6.38 hr. at 38°F, $Q_{10}$ = 3.8 (5). These values are reasonable for pseudomonas spp. Predicted increases are based on the average observed total plate count (TPC) of $4 \times 10^5$ organisms/g. It is assumed that the organisms are in the log phase of growth by the time they reach the assemble/load critical control point.

Table 2 provides an insight into the temperature variations in each of the 5 critical control points. Based on the "Max." temperatures, the variation during assembly and loading is relatively minor. The temperature variations during transport and place in walk-in are relatively large.

TABLE 1. *Time - temperature history of fresh and frozen beef and ground beef patties.*

| Critical Control Point Number and Name | Average Temperature o.a. F | Maximum Time |
|---|---|---|
| 1. Store frozen | -6.8 | 2 mos. |
| 2. Store refrigerated | 34.5 | 4 days |
| 3. Pre-microwave | 24.5 | 4 hrs. |
| 4. Post-microwave | 26.7 | 1 hr. |
| 5. Flake/slice | 29.2 | 1 min. |
| 6. Hopper (mix) #1 | 29.3 | 30 mins. |
| 7. Hopper (mix) #2 | 29.6 | 30 mins. |
| 8. Patty machine hopper | 29.6 | 30 mins. |
| 9. Patty | 30.3 | 45 mins. |
| 10. Refrigerated patties, just produced | 34.8 | 2 days |
| 11. Refrigerated patties, one day old | 30.6 | 2 days |
| 12. Assemble/load | 39.8 | 2 hrs. |
| 13. Transport | 45.6 | 12 hrs. |
| 14. Receive at restaurant | 42.8 | 30 mins. |
| 15. Place in refrigerated walk-in | 41.6 | 1 hr. |
| 16. Store refrigerated walk-in | 33.2 | 2 days |
| 17. Store refrigerated drawer | 34.8 | 1 day |
| 18. Cook | 161.3 | 3 mins. |
| 19. Serve | 119.2 | 5 mins. |

[a]·Average of the separate measurements on three different days.

TABLE 2. - *Temperatures and predicted bacterial growth[a] in ground beef patties during selected critical control points.*

| Critical Control Points | Ave. temp, $\bar{T}$, °F | "Max." temp, $\bar{T}$ + 3 sigma | Duration, hr. | Predicted increase[b] (log growth) $\bar{T}$ | $\bar{T}$ + 3 sigma |
|---|---|---|---|---|---|
| Assembly and loading | 39.8 | 42.9 | 2 | 0.11 | 0.14 |
| Transport | 45.6 | 59.3 | 12 | 0.99 | 2.75 |
| Place in walk-in | 41.6 | 60.0 | 1 | 0.06 | 0.24 |
| Store, walk-in | 33.2 | 36.7 | 48 | 1.59 | 2.06 |
| Store, refr. drawer | 34.8 | 40.2 | 12 | 0.45 | 0.67 |

[a]Based on a generation time of 6.38 hr. at 38°F, $Q_{10}$ = 3.8, a reasonable set of values for pseudomonas spp.
[b]Average total plate counts of finished patties is 4 × $10^5$ organisms/g. If shelf life ends at $10^7$ organisms/g., an increase of 25-fold is the average limiting increase. The log of 25 is 1.4.

As stated, the average observed TPC was 4 × $10^5$ organisms/g. Shelf life is commonly thought to end at $10^7$ organisms/g. (6). That being the case, the cummulative increases (i.e., the sum of all the predicted increases) added to the average observed TPC would result in a value of $10^9$ organisms/g. This value, calculated based on maintaining the average temperatures, is well above the $10^7$ organisms/g. limit.

It might also be beneficial to consider that the $\log_{10}$ of the average observed TPC is 5.6. Since the $\log_{10}$ of the end of shelf life is 7.0, the difference is 1.4. That difference is the margin available to work with. If the predicted increased based on $\bar{T}$+ 3 sigma are individually added to 5.6, the value of 7.0 is reached *prior* to completion of the transport critical control point. In other words, the product has already reached the end of shelf life before it is placed in the walk-in. Even though the $\bar{T}$+ 3 sigma may rarely occur, that value must be monitored for planning purposes.

The predicted increases occur so rapidly because the representative pseudomonas spp. has a relatively large $Q_{10}$. It is clearly a case where if the organisms are given an inch, they will take a mile. These increases were calculated using the average observed TPC. The standard deviation of the actual counts is such that the upper 3 sigma limit exceeds $10^7$ organisms/g.

## RECOMMENDATIONS

Time-temperature relationships are critical at the five identified processing points because prolonged exposure to the temperature danger zone can lead to microbiological proliferation. Proper review of the time-temperature history of a food product can red-flag the process stages at which microbiological proliferation is likely to occur. Within each foodservice system, identification of time-temperature critical control points involved in food handling is of paramount importance for adequate control of food safety and quality. In addition, sensory attributes of the food product can be negatively affected through inadequate time-temperature control. To minimize these adverse effects on the food product, it is recommended that the item not be exposed to the temperature danger zone any longer than absolutely necessary.

Product environmental temperatures should be monitored on a regular, random basis as a part of the overall quality system. Any problems associated with delivery truck refrigeration equipment during the transport critical control point can be quickly identified and corrected. In order to minimize the likelihood of the increases discussed in Table 2, several alternative courses of action can be implemented. Decreases in the temperature and/or the time spent in each of the critical control points will minimize the increases in TPC. In addition, the commissary purchasing agent should specify lower acceptable counts in the raw products purchased. The Pareto principle would red-flag both the transport and store, walk-in critical control points (7). These are the two critical control points on which to focus staff efforts.

Raw fresh and frozen beef delivered to the commissary should be examined to obtain an average product temperature. Accept/reject decisions should be based, in part, on that temperature check. Products arriving at the commissary with temperatures in excess of 40°F should be classified as marginal and should be accepted or rejected based on the results of additional inspections regarding microbiological load. Likewise, ground beef patties delivered to the restaurant should arrive at temperatures of 40°F or below. It is important to have a member of the management team, or its representative, present to check and record these incoming product temperatures.

Products stored refrigerated or frozen in the commissary and chilled in the restaurant should be checked daily to determine internal product temperatures and signs of deterioration. In addition, storage area temperature should be monitored daily to minimize potential problems associated with microbiological proliferation and food spoilage. Establishing and monitoring time-temperature standards in both the commissary and restaurants provides a practical method for estimating product quality and safety. Once these standards are established by management, they must be communicated to lower levels of management and the employees during the training phase. The individuals directly involved should be trained in methods of accurately and correctly determining and recording product and storage area temperatures.

After the HACCP procedure was used to monitor time-temperature relationships, the recommendations developed minimized the system deficiencies. Recommendations for minimizing product contact with the temperature danger zone enhanced the firm's quality assurance efforts. These recommendations permitted management to be proactive, rather than reactive, and have the potential to translate directly to the firm's bottom line through increased customer satisfaction.

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# Measurement and Reduction of Iodine in Milk

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*Excess iodine in milk has been recognized as a potential public health concern in recent years. It is widely recognized that most of the excess results from the feeding of excess iodine to the dairy cow. Strategies for creating awareness about the problem are outlined, and advice for dairymen about how to manage iodine in the dairy cow ration. Procedures for measuring iodine in milk are outlined. Experience from educational programs and demonstration projects in Nebraska indicate that the problem of excess iodine in milk is an easy one to solve.*

The total iodine content of the typical American diet is far in excess of the amount required for adequate nutrition (19). Most of the excess iodine comes from dairy products (Table 1). Although the American Thyroid Association issued a statement in 1974 (1) that increasing the iodine intake may precipitate human disease, the average amount of iodine actually consumed by Americans has, in fact, increased since then. The increase was due mainly to the increasing amount of iodine found in milk (16). However, there have been no reports of increased health problems in the U.S. associated with this higher iodine intake.

In Australia, the National Health and Medical Research Council recommended an upper limit of 500 μg iodine/l of milk (21). As a result, Australian milk marketing authorities routinely monitor milk for iodine. The legal upper limit in Czechoslovakia is 100 μg/l (6). A health official from the German Federal Republic recently stated that the iodine content of milk should be restricted in herd and retail milk by keeping iodine contents below 500 and 200 μg/l, respectively (7). U.S. authorities generally consider that milk iodine levels above 500 μg/l are undesirable. Numerous surveys (including the states of Wisconsin, California, Michigan, Illinois, Maryland, Kentucky, Kansas, South Dakota and Nebraska) indicate milk iodine levels are often above 500 μg/l (3,17,19,20). Even so, iodine levels in U.S. produced milk are not regulated and future regulation of iodine does not appear likely.

TABLE 1. *U.S. Food and Drug Administration Total Diet Study -- Selected Minerals in Foods Survey (16).*

| | Iodine Intake | | Amount From Dairy Products |
|---|---|---|---|
| | Required[a] (μg/day) | Actual[b] (μg/day) | (%) |
| Infants | 45 | 576 | 80.8 |
| Toddlers | 70 | 728 | 55.6 |
| Adults | 150 | 696 | 56.0 |

[a]U.S. Recommended Dietary Allowances.
[b]1978 Data - Total iodine content was proportionately adjusted to 2,850 Kcal.

The primary source of excess iodine in milk is widely recognized to be the dairy cow ration, either from feeding EDDI (ethylenediamine-dihydroiodide) to treat or to prevent respiratory problems, lumpy jaw and/or foot rot or from feeding supplemental iodine from multiple sources. Fortunately, EDDI manufacturers no longer recommend the feeding of EDDI to prevent or treat these disorders in lactating dairy cattle whose milk will be used for human consumption (12).

Iodine-containing teat dips, premilking udder sanitizers and equipment sanitizers generally contribute much less iodine to the milk than does feed. Milk iodine attributable to iodophor sanitizers is minimal and does not detract from its use for such purposes. Manufacturers of iodophor teat dips have reformulated their products to reduce iodine contamination from this source. Recently, a patent has been granted (U.S. 4,271,149) for a new method of stabilizing

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iodine in antimicrobial products (2). The new product reportedly reduces the amount of iodine needed in teat dip formulations. This development should reduce iodine contamination of milk.

Because excess iodine in milk is a public health concern and may cause loss of market and because the feeding of excess iodine may cause cow health problems (10,15), it behooves the dairy industry and dairy farmers, in particular, to better control the level of iodine in the milk they produce.

**SOLVING THE PROBLEM**

Extension specialists (i.e., extension dairymen, extension dairy cattle nutritionists, extension veterinarians and extension food scientists) as educators and as "agents of change" are particularly well suited to help solve the problem of excess iodine in milk. One of the first steps such individuals can take is to survey the iodine concentration in bulk tanker loads of milk. Iodine assays for such a survey can be performed by a commercial laboratory, by an academic institution, by a milk quality laboratory, or by a regulatory laboratory.

A raw milk iodine assay is described herein as adapted from several sources (11,13,21). The method is suitable for raw milk only. (Note: other types and brands of equipment can be used for this analysis.)

Determination of Iodine in Milk Using the
Iodine Specific Ion Electrode

*Materials and Methods*

I. Orion Equipment and Materials
- A. 701A Digital Ionanalyzer
- B. 94-53A iodide specific ion electrode
- C. 90-01 single junction reference electrode
- D. 90-01 single junction reference electrode filling solution
- E. 94-82-01 polishing strips
- F. 94-53-06 iodide standard solution

II. Other Equipment and Materials
- A. Water bath to adjust samples and standards to room temperature (approximately 25° C)
- B. Magnetic stirrer, magnets, cardboard insulation pad
- C. Thermometer
- D. Glassware
  - 1) 150 ml beakers
  - 2) A 50 ml graduated cylinder
  - 3) 1 ml pipettes for 2 M Ni $(NO_3)_2$
  - 4) 10 ml pipettes for making standards
  - 5) Wash bottle for distilled $H_2O$
  - 6) Volumetric flasks for
    - a) 2M Ni $(NO_3)_2$ Ionic strength adjuster (ISA)
    - b) 0.1 M iodide standard solution
    - c) KI, $1 \times 10^6$ µg I/l (Standard Stock)
  - 7 Reagent bottles
- E. Single use tissues for wiping and blotting dry the electrodes
- F. Chemical reagents

1) 2 M Ni $(NO_3)_2 \cdot 6H_2O$ (nickel nitrate) - To prepare 100 ml: Dissolve 58.14 g in distilled $H_2O$; dilute to 100 ml.

2) 0.3% (w/v) disodium EDTA/sodium dodecyl sulfate - To prepare: Dissolve 3 g disodium EDTA and 3 g sodium dodecyl sulfate in distilled water. Dilute to 1000 ml.

3) 50% (v/v) acetone/$H_2O$ - To prepare: Add together 500 ml acetone and 500 ml $H_2O$.

4) 0.1 M iodine standard solution - To prepare: Begin by oven drying KI (potassium iodide) at 120° C (248° F) for 1 hour. Weigh out 1.66 g KI and dissolve in 100 ml of distilled water. Store in aluminum foil covered container. A change in the potential of the standard solution measured in absolute MV was fused as an indicator of its stability.

5) KI solution containing $10^6$ µg I/l. (Standard Stock) - Prepare by oven drying KI. Weigh out 1.308 g KI and dissolve in 1 liter of distilled $H_2O$.

III. Daily Procedures

Electrode Care and Preparation

A. Fill reference electrode, making certain that the filling solution is 2.54 cm above solution being measured. So that the elctrode will not dry out, it should be stored under a parafilm seal in distilled $H_2O$ in a flask. The reference electrode may be kept in this manner overnight or longer to stop the formation of crystals on the membrane and inside the sleeve.

B. Polish specific iodide ion electrode daily with polishing strip.

C. To equilibrate electrodes, place both into standard solution containing iodide (0.1 M KI) and ISA for 30 min. To 100 ml of distilled $H_2O$ add:
- 1) 1 ml 2 M Ni $(NO_3)_2$
- 2) 1 ml 0.1 M KI

IV. Standard Curve Procedure (the following must be repeated daily):

A. Plot a standard curve by first preparing dilutions of the KI Stnadard Stock solution.

| | | |
|---|---|---|
| 1/10 dil of stock | ⟶ | $1 \times 10^5$ µI/l |
| 1/10 dil of above | ⟶ | $1 \times 10^4$ µI/l |
| 1/10 dil of above | ⟶ | $1 \times 10^3$ µI/l |
| 1/10 dil of above | ⟶ | $1 \times 10^2$ µI/l |

To 50 ml of each dilution add 0.5 ml 2 M $Ni(NO_3)_2$ or ISA. The potentials of the solutions (at approximately 25° C) are measured in relative millivolts (REL MV) while they are stirred with a magnetic stirrer and recorded when a change $<0.5$ MV is observed in 2 min. Readings from the 4 standard solutions are plotted on 3 cycle semi-log paper with REL MV readings on the linear axis and iodide concentrations on the log axis. The meter should be zeroed on the $10^3$ standard solution by switching the function knob to REL MV and turning the calibration knob until the reading is 000.0 and there is $<0.5$ MV change in 2 min. The other standards are first read on the REL MV setting when a change of $<0.5$ MV in 2 min occurs. Iodine concentration of the milk solutions are obtained from this standard curve.

V. Milk Sample Preparation

A. Warm sample to room temperature (approximately 25° C).

B. Shake sample in vial 25 times in a 1 foot arc in 7 sec.

C. Pour into graduated cylinder and measure to the nearest ml.

D. To each sample add 2 M $Ni(NO_3)_2$ in a ratio of 1:100. For example, to 50 ml of milk, 0.5 ml of 2 M $Ni(NO_3)_2$ would be added. To 40 ml of milk, 0.4 ml of 2 M $Ni(NO_3)_2$ would be added.

E. Place rinsed and blotted electrodes in sample.

F. Record digital output in REL MV mode when a change of <0.5 MV in 2 min is observed.

G. Read iodine concentration of milk solution from the previously determined standard curve.

IV. Cleaning of Electrodes Between Samples

A. Rinse with distilled $H_2O$ to remove excess milk and blot.

B. Soak for 10 sec in 0.3% (w/v) disodium EDTA/ sodium dodecyl sulfate.

C. Rinse with distilled $H_2O$ and blot.

D. Soak momentarily in solution of 50% (v/v) acetone.

E. Final rinse with distilled $H_2O$ and blot dry.

Note: Because the above described procedures do not represent a published "standard method" the performance of a collaborative study to ascertain the accuracy and precision of these procedures is probably warranted.

## REDUCING ON-FARM SOURCES OF IODINE

When problem milk routes are identified, bulk milk samples can be analyzed to identify problem herds (iodine concentration <500 μg/l). Managers of these herds should be contacted and the dairy ration evaluated for sources of excess iodine. The feeding of EDDI should be discouraged for several reasons: 1) The manufacturers of EDDI recommend that prevention and treatment levels of EDDI should not be administered to animals whose milk will be used for human consumption or food processing (12); 2) The efficacy of EDDI as an aid in the prevention and treatment of foot rot, lumpy jaw and bronchitis is questionable (17), therefore, any sacrifice in dairy cow health due to elimination of EDDI as a treatment strategy appears minimal; 3) Feeding excessive EDDI and other iodides to cattle may predispose various herd health problems (10,15).

Multiple sources of iodine in the ration have also contributed to excessive levels of iodine in milk. Although iodine naturally contained in feeds will supply a significant amount of iodine needs, supplemental iodine is still recommended to assure an adequate amount and to overcome goitrogenic feeds. A good rule of thumb is to use only one source of supplemental iodine.

The following are recommendations made by the University of Nebraska-Lincoln for supplementing iodine in rations for milking cows (14):

Trace mineralized. . . .or iodized salt (0.005 to 0.01% iodine) at the concentration of 1% of the grain ration.

Or. . . .protein supplement included at about 500 pounds per ton of grain ration (with 0.0002 to 0.0004% iodine) -- 10-25 pounds per day of grain ration. (Higher levels of iodine should be used when fed with high protein grain rations.)

Or. . . .free-choice trace mineralized or iodized salt (0.005 to 0.01% iodine) -- 3 ounces per day. (Including iodine in grain ration mixture, rather than free-choice, prevents widely varying intakes of free-choice minerals.)

Iodine teat dips also increase the iodine content of milk (8). Such products probably contribute less than 100 μg of iodine/l to the milk. Thoroughly washing and drying the teats during premilking udder preparation reduces by one-half or more the amount of iodine contributed by iodine teat dips (9).

Iodine sanitizers used in backflushing equipment for preventing the spread of mastitis when operated properly, probably contribute less than 50 μg of iodine/l (4). Premilking udder sanitizers may contribute as much as 35 μg of iodine/l (4,9). The use of paper towels to dry off teats before attaching the milker will significantly reduce iodine contamination from this source. Inadequate rinsing and drainage of bulk tanks that have been sanitized with iodine sanitizers may also contribute additional iodine to dairy products (5).

Obviously, dairymen, dairy fieldmen, milk cooperatives, grain and feed dealers, feed salesmen, dairy quality control laboratories, dairy processors, regulators, and veterinarians need to be informed about the need to control and monitor iodine levels in milk. Furthermore, dietitians and physicians should know that milk is an important source of iodine in the diet.

## HOW TO INFORM THEM

To effectively create awareness about the problem of high levels of iodine in milk, a multi-media approach is needed, i.e.:

1) Live educational programs sponsored by the Cooperative Extension Service (there is an extension office in nearly every county of the U.S.) or meetings sponsored by other relevant groups such as: grain and feed dealers, dairymen, dairy fieldmen, dairy equipment dealers, veterinarians, and regulators.
2) Contributions to newsletters for these groups
3) Press releases
4) Milk check inserts
5) Radio programs
6) Direct consultation in person or via the phone
7) Herd demonstration projects

TABLE 2. *Iodine Content of Bulk Raw Milk Produced in Nebraska (1981, Ref. No. 20).*

| Concentration | No. of Samples | Percentage |
|---|---|---|
| Less than 500 μg/l | 92 | 54.44 |
| 500 to 999 μg/l | 49 | 28.99 |
| 1000 to 1499 μg/l | 16 | 9.47 |
| More than 1500 μg/l | 12 | 7.10 |
| Total | 169 | 100.00% |

TABLE 3. *Milk Iodine Levels in Mastitis Control Demonstration Herds (32 herds) Sampled Twice During 1981.*

| | Spring 1981 | Summer 1981 |
|---|---|---|
| Percent of samples containing more than 500 μg/liter | 28% | 12% |
| Percent of samples containing more than 1000 μg/liter | 19% | 3% |

## THE NEBRASKA EXPERIENCE

During the early part of 1980, approximately 169 Nebraska-produced bulk milk samples were analyzed for iodine. Results of this survey are presented in Table 2. Approximately 46% of the samples in this survey contained iodine in a concentration in excess of 500 μg/l. In another survey of milk iodine levels from 32 herds cooperating in the Nebraska Mastitis Control Project the mean iodine content was approximately 546 μg/l. Producers whose herds had a relatively high level of iodine were provided information about how to manage the feeding of iodine. A resurvey of these same producers several months later showed that the percentage of herds with high iodine levels had decreased and that the mean iodine concentration was only 318 μg/l. A summary of the results of this survey is presented in Table 3.

Results from the surveys indicate that to assure continued low milk iodine levels, dairy producers need to avoid the feeding of multiple sources of iodine in the ration. Further, they should not feed their cattle EDDI to prevent or treat foot rot and lumpy jaw. To further assure that low milk iodine levels are maintained, personnel in milk quality labs will need to be trained to monitor for milk iodine. As a result of assisting and training laboratory personnel at the University of Nebraska-Lincoln, nearly 4,000 midwest milk producers are now having their milk monitored for iodine.

## CONCLUSION

Research shows that there is frequently excess iodine in cow milk. It has also shown its origin. Extension workers within land-grant colleges can create an awareness of this problem among dairymen and other relevant groups, thereby helping the dairy industry reduce the incidence of excessive iodine in milk and avoid a potential problem in the future.


### ACKNOWLEDGMENTS

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# Milk Memos

## PREVENTING ABSORBED FLAVORS OF MILK

Nearly all absorbed flavors of milk originate in the stanchion or free stall barn where cows are fed and housed. Silage and unclean odors and flavors get into milk via the respiratory or digestive systems of cows. Persons who sample and collect milk from farms can detect these by odor.

## FEED FLAVOR OF MILK

**Sidney E. Barnard**

*Professor of Food Science Extension*
*The Pennsylvania State University*

Strong feed flavors have been detected in about 5% of retail samples and about one of every ten farm samples of milk during recent years. Although not the most objectionable flavor, some consumers think that the grass or silage flavor indicates that the milk is spoiled. Weed flavors are seldom detected, but silage is quite common.

All feed flavors are absorbed through the cows system rather than directly into milk. Cows impart an odor and taste within 30 minutes of eating or breathing silage. It is strongest after about one hour.

The odor and taste of grass or silage, legume hay and brewers grain are most troublesome. Grass hay, grain concentrates, molasses and urea do not cause off-flavors. The two absorption methods are:

*Breathing*

Mouth or Nose - Lungs - Blood - Milk

*Eating*

Mouth - Digestive Tract - Blood - Milk

Strong silage odors in conventional stables or free stall housing areas cause as strong of flavors as when cows eat the offending feed. Adequate ventilation is essential. Stables are usually mechanically ventilated while proper design of ridge and eave openings is the key in free stall buildings.

Any feeds, especially silage, should be fed after milking. Cows should not have access to silage for a period of two to four hours prior to milking. The absorption process is reversed if sufficient time elapses prior to milking.

No processing procedure removes a feed flavor of milk. Prevention is the key.

1. Keep cows away from silage for two to four hours prior to milking.
2. Eliminate objectionable feeds from the cows diet or feed after milking.
3. Provide adequate ventilation of feeding and housing areas.
4. Change feeds gradually, such as barn feeding to pasture.

## UNCLEAN FLAVORS OF MILK

**Sidney E. Barnard**

*Professor of Food Science Extension*
*The Pennsylvania State University*

Five to ten percent of farm milk samples have an unpleasant, dirty after taste. Frequently it is an absorbed flavor, as is silage. Usually the cows breath air with a barny, cowy odor and impart it to the milk. Regardless of the cold temperatures, dairy housing must be ventilated. This means exhausting stale air and taking in fresh air. Closed stables require mechanical ventilation while free stall barns need properly designed intake vents and a ridge ventilator.

Dust, dirt and manure cause an unclean flavor of milk. Cows and surroundings must be kept reasonably clean. Milking equipment which has not been properly cleaned and sanitized may be a cause.

Just one or two cows in the average sized herd with ketosis will cause a chemical-like, unclean flavor. Most dairy farmers can detect this by smelling the air which a cow exhales. This odor and taste is persistent and objectionable. Keep the milk out of the bulk tank. Isolate the cow, if possible.

Washing cows' udders with water and failing to dry them leads to unclean flavors. Inspection requirement specify a sanitizer solution. For best results use paper towels or cow cloths. Be sure to dry the excess moisture.

To prevent unclean flavors follow these suggestions:

1. Keep floors, walls and ceilings of dairy housing and milking areas reasonably clean.
2. Ventilate cow housing areas so that the air does not have a rank, stale odor.
3. Clip hair from udder teats and flanks of milking cows.
4. Provide adequately bedded stalls, so that cows may lie down.
5. Wash udder and teats with a sanitizer solution and dry prior to attaching milker units.
6. Clean and sanitize all milk handling equipment between uses.
7. Withhold milk from cows with ketosis.

# News and Events

## W. R. (Mac) McLean 1906-1082

Wilbert (Mac) McClean died July 2, 1982 while on a family fishing trip.

McClean was employed by the U.S. Public Health Service from 1950-1970 when he retired. He was awarded the U.S. Public Health Service Accomodation Medal in 1969.

Mac assisted with the development of the 3-A Sanitary Standards for farm milk cooling and holding tanks, and for silo-type tanks and 3-A Accepted Practices for sanitary construction, installation, testing and operation of HTST Pasteurizers and Milk and Milk Products Spray Drying Systems.

In 1969 he was awarded the Sanitarian's Award by IAMFES. This annual award was presented to Mac for demonstrating technical acumen and professional skill in evaluating and reviewing equipment and techniques in the milk and food industry.

Family members include his wife Nora, daughter Mrs. James (Stephanie) Pellitteri, Rothschild; a son Rodney, Boise, Idaho; brother Gordon, ParkRidge, IL and two grandchildren.

## Arthur A. Rogers, President of C. E. Rogers Co., dies unexpectedly

Arthur A. Rogers, president of C. E. Rogers Co., Wyandotte, MI, died of a heart attack May 29 while fishing in Canada.

Rogers was also treasurer of DFISA since 1969, where he was elected to the board of directors in 1966. He was co-chairman of the technical committee since 1972. He received the DFISA Honor Plaque in 1981, which is the highest honor bestowed on a member.

Family members include his wife Jane, sons Arthur Jr. and Howard, daughters Jean Fernandes, Jane Clark and Marjorie Marrichi, and several grandchildren.

## *Coleman joins MN Dept. of Agriculture*

William B. Coleman, II, administrative chairman of the food industry and technology division of the University of Minnesota, Waseca, will join the Minnesota Department of Agriculture as director of the Dairy Industries Division in mid-September, Commissioner Mark Seetin announced today.

Coleman will fill the key regulatory position for Minnesota's $3 billion dairy industry vacated earlier this year by the retirement of Orlowe M. Osten, who had earned national recognition during his 33 years of service in the state agency.

The new director of the Dairy Industries Division brings 22 years of professional experience in the dairy industry and academic food science community to the position. A Pennsylvania native, he has a master's degree in food science from Penn State University.

Prior to his past five years on the University of Minnesota, Waseca, faculty, Coleman spent 10 years as an instructor in food science and manager of the creamery at Penn State University. His first seven years after graduating from Penn State were spent as production manager for the Berkey Milk Company, a grade A dairy products manufacturer in Somerset, Pennsylvania.

In announcing the appointment of Coleman, Commissioner Seetin also commended Bruce Marzolf, northern and southern supervisor in the Dairy Division.

## Barrett Vice-President of H. B. Fuller

Robert B. Barrett has been named vice president, of H. B. Fuller Company, St. Paul, Minnesota.

In his position, Barrett will manage the operations of the Monarch Chemicals Division, a compounder of sanitation chemicals for the food processing industry.

A veteran of 35 years in the sanitation industry, Barrett joined Monarch in 1976 as director of research and development. In 1981 he was named division manager.

Barrett holds a B.S. in chemistry from Beloit College, Beloit, Wisconsin. He is a member of the American Chemical Society and the Institute of Food Technologists.

H. B. Fuller Company is a manufacturer of adhesives, sealants, coatings, paints, and specialty waxes, as well as floor maintenance equipment and sanitation chemicals. The company has plants and technical service centers in 40 U.S. cities and 25 foreign countries worldwide.

## *Nominations for 83 Food Engineering Award*

Nominations for the 1983 Food Engineering Award are now being accepted by Dairy and Food Industries Supply Association and American Society of Agricultural Engineers, sponsors of the award. Deadline for nominations is January 15, 1983.

The award is presented biennially for original contributions in research, development or design or in the management of food processing equipment or techniques having significant economic value to the food industry and the public. The award consists of a gold medal, certificate and $2,000 cash stipend.

Candidates will be evaluated on the application of human performance and progress to engineering and technology, development of machines, processes or methods for the food industry, and leadership in the professional development of the food industry.

Nomination should include a 500-word statement describing the nominee's achievements and recognition in the food industry, how he meets the award criteria, professional and business history, published works, educational background and organizational memberships.

Nomination may be made in letter form or in the official form, available from James L. Butt, ASAE executive secretary, 2959 Niles Road, St. Joseph, Michigan 49085.

## AFDO Offers Sanitation Code

The Association of Food & Drug Officials (AFDO) announces the availability of the model Retail Food Store Sanitation Code--1982 Recommendation of the Association of Food & Drug Officials and the U.S. Department of Health and Human Services.

This document provides industry and State/local governments with a uniform food protection code for the operation and regulation of retail food stores.

The Code is available from AFDO only. For additional information, contact: Whitney W. Almquist, Executive Assistant at 717-757-2888.

## *Natzke Recipient of 82 West Agro-Chemical Award*

Dr. Roger P. Natzke, chairman of the Dairy Science Department, University of Florida, Gainesville, received the 1982 West Agro-Chemical Company Award for outstanding contributions in dairy science. The award was presented at the annual meeting of the American Dairy Science Association, held in June at The Pennsylvania State University.

Natzke, who received his B.S., M.S. and Ph.D. in Dairy Production from the University of Wisconsin, spent 15 years at Cornell University. His appointments there included research, teaching, extension and administration. He assumed the leadership role for one of the few extensive field studies conducted on mastitis control in the United States.

The three year-study, conducted in cooperation with the National Institute for Research in Dairying, Reading, England, demonstrated both the effectiveness and economic value of teat dipping and dry cow therapy in commercial dairy herds.

During the last five years he has conducted research on many facets of milking management and mastitis control.

He has been an ative member of ADSA, the National Mastitis Council, National Mastitis Research Workers, and Northeast Dairy Practices Committee.

## Highlights of 3-A Sanitary Standards Committee Meeting

A new 3-A Sanitary Standard for Mechanical Conveyors of Dry Milk and Dry Milk Products and amendments to the Fittings Standard and the Silo-Type Storage Tank Standard were approved at the spring meeting of the 3-A Sanitary Standards Committees at Milwaukee, May 11-13, 1982.

The mechanical conveyors standard sets the criteria for the conveying of dry milk and dry milk products. It will become effective in the fall of 1983. The amendments cover an additional suggested method for cleaning silo-type storage tanks, and a rupture disc fitting. These amendments will be effective in September of 1983.

The highlight of the 3-A meeting was the award of the Dairy and Food Industries Supply Association (DFISA) Special Honor Certificate to Robert E. (Pinky) Holtgreive for his extraordinary service to the 3-A Committees and the standard program. Hotgreive has been a representative to the 3-A Committees for over 25 years and has been instrumental in advancing the development of new E-3-A Standards for the poultry industry.

Agenda items referred to DFISA Technical Task Committees for additional work or future action included standards affecting evaporators and vacuum pans, farm holding and cooling tanks, farm storage tanks, wet collectors, filters, batch processors and accepted practices for membrane processing.

The meeting was attended by 85 state and local sanitarians, officials of the U.S. Public Health Service and industry participants representing dairy processors and suppliers.

3-A Standards and Practices for the cleanability of dairy processing equipment safeguard the public health by protecting the product against contamination from the equipment itself or foreign elements of dust, dirt or liquids. The program is conducted through the voluntary participation of dairy processors, equipment manfuacturers, public health officials and sanitarians and their trade and professional associations. Standards have been issued over the years covering 42 types of processing equipment. In general, 3-A standards and practices are accepted in most public health jurisdictions at the federal, state and local level. They are cited in the recommended Grade "A" Pasteurized Milk Ordinance of the U.S. Public Health Service.

# Research on Size of Dairy Cows at the University of Minnesota

Bigger isn't necessarily better when it comes to dairy cows, researchers with the University of Minnesota Agricultural Experiment Station have found. In fact, data collected from a Holstein herd in which two lines--one of large animals, the other of small--have been developed at the Northwest Experiment Station, Crookston, show that smaller cows are, on the average, 4.5 percent more efficient in producing milk.

Animal scientist George Marx, who manages the Crookston herd, says the two lines were developed over the past 16 years by using small and large sires on the herd's cows, which were originally mediumsize. Each year, he has mated small sires with small cows and large sires with large cows.

"Sires are selected on the basis of their size, particularly their stature, and their ability to transmit their size to their offspring," Marx says. "We also pick bulls with a high predicted difference for milk production. There are now about 30 sires from studs throughout the United States represented in the 68 cows in our herd."

Animals of the two lines have become progressively smaller or larger with each generation. Last year, male and female calves from small sires averaged 92.6 and 82.2 pounds at birth, respectively, while those from large sires weighed an average of 95.2 and 89.3 pounds. Cows of the small line weighed an average of 1,157 pounds at the beginning of their second lactation; those of the large line, 1,257 pounds.

Marx and fellow animal scientist John Donker have measured the feed conversions of the cows in the two size groups over 248 lactations. They have obtained feed conversion data for three feeding ratios of grain--a pound of grain for every 5 pounds, 3 pounds,or 1.5 pounds of milk produced daily in excess of 20 pounds.

Each cow remained on the same grain-to-milk ratio for both of her first two lactations and all cows received the same feedstuffs, rolled or coarse-ground grain and corn silage or haylage. Forage was fed to appetite, and forage and grain were weighed individually for each cow at every feeding.

Donker and Marx report that the small cows consumed an average of about 39 pounds of feed daily, or 3.4 percent of their body weight. On the average, the large cows ate almost 41 pounds of feed per day, 3.2 percent of their body weight. Cows of both size groups ate less forage and produced more milk as more grain was fed.

The average proportion of grain in the dry matter fed for the low-, medium- and high-grain groups was 12.2, 20.3 and 37.1 percent. The dry matter consumed for the same feeding regimens was 39.2, 40.1 and 40.1 pounds per cow per day. Total digestible nutrient (TDN) content of the dry matter in the total ration was 60.7, 62.5 and 66.2 percent for the low-, medium- and high-grain treatments.

With both large and small cows, milk yield showed the effect of diminishing returns. The average increase in fat-corrected milk (FCM) per pound of added grain was 0.90 pound for the change from low- to medium-grain levels, and 0.22 pound between the medium- and high-grain levels. Cows fed the medium level of grain have been the most efficient in the use of net energy for milk.

The researchers report that the average daily production for the small and large cows was 43.9 and 44.1 pounds of milk or 43.9 and 43.4 pounds FCM, respectively. This is 3.8 pounds FCM per 100 pounds of body weight for the small cows and 3.5 pounds for the large cows.

On the average, the small cows used 0.58 pounds TDN to produce a pound of FCM, compared to 0.60 pounds TDN for the large cows. So far, the small cows have been 4.5 percent more efficient than the large cows in converting feedstuffs to milk, the researchers calculate.

Marx theorizes that most of the difference in efficiency of feed conversion is due to the large cows' need for more feed for growth and body maintenance.

"There are some good, highly efficient large cows and some good, highly efficient small cows in our herd," he says, "and there's quite a bit of variation among cows in each size group as far as efficiency is concerned."

Marx points out that smaller cows can have some disadvantages--lower salvage values, for example, as well as problems in keeping stalls designed for larger animals clean. And, he has noticed quite a difference in how steers from the two size groups finish.

"Steers from our herd's large cows usually finish at about 1,300 pounds, while those from the small cows finish at about 1,100 pounds," he says. "And, it takes about two months to feed the large steers to finish."

Donker says one of the long-term objectives of the research is to compare the useful productive life of small and large cows. "We ultimately would like to find out how well cows of each size wear," he says. "It may be that a more efficient small cow will not remain in good health and production as long as a larger cow."

For more information contact: George Marx, 218-281-6510 or John Donker, 612-373-1110.


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## Energy and Labor Efficient Dairy Barn

Labor efficiency and energy conservation are two of the major design features of the new dairy barn at Fair Hill Farm, Kennedyville, MD.

The barn was constructed by Agri, Inc., Ephrata, Pa. The innovative design features make is possible to operate the large dairy (500 cows milked three times a day) with only eight workers.

Ed Fry, owner of Fair Hill Farms, Inc., a family owned and operated business, noted that the people at Agri were very cooperative about incorporating his ideas into the barn design. "I'd give them my ideas, and they would put them down on paper," Mr. Fry said.

It was one of Mr. Fry's energy conserving ideas that led Agri to select Reynolds Aluminum Rainlock painted farm sheet for both the roof and the sidewalls. Mr. Fry requested that the sidewalls be removable in the summer months for complete ventilation. The lightweight Reynolds Aluminum siding particularly suited this application because of "its ease of handling; and if it gets scratched, it will not rust," John Brubaker of Agri said.

When reinstalled in late October, the aluminum siding, as well as the roofing, helps to maintain an even temperature by reflecting radiated heat back inside.

The Reynolds Rainlock roofing also provides cooling shade for the cows and workers during the summer months.

The barn required 1,250 squares of Reynolds Rainlock painted roofing and siding.

Additional energy conserving features include two heat recovery systems that help supply hot water, as well as bunker silos and a commodity shed that eliminate the need for intensive mechanization for feeding.

Labor is conserved over the long term because the aluminum exterior needs minimal maintenance.

Labor is conserved each day because workers are freed of chores by automatic take offs, air operated gates, a sprinkler system for washing cows, and fully automated crowd gates.

Additional information is available by contacting Reynolds Metals Company, Building Products Group, P.O. Box 27003, Richmond, Va. 23261 or Agri. Inc., Ephrata, Pa. 17522.

## *DFISA Directory of Suppliers Available*

The 1982 Directory of Suppliers is available to all dairy and food processors according to Dairy and Food Industries Supply Association. The supplier directory lists all DFISA member firms, including addresses; telephone, telex and TWX numbers; key contact person for each office; product or service category of the firm (distribution and transportation, ingredients, processing, packaging, or services); and specific product and/or services the firm supplies.

This year's lists members throughout the U.S., and in 8 foreign countries. The directory also lists key officers and committees of the association, important industry meeting dates and special services offered by DFISA. Supplier companies are listed alphabetically, geographically and by product and/or service they supply to the food processing industries. Altogether 519 DFISA members and 330 product/services are listed.

Food and dairy processors interested in receiving a copy of the directory should send their request, on company letterhead to: Dairy and Food Industries Supply Association, 6245 Executive Boulevard, Rockville, Maryland 20852.

## New Floor Cleaning Machine

A new line of automatic floor cleaning machines especially designed for keeping clean difficult areas where food is sold, processed, prepared, and served, is being introduced by Hako Minuteman. In food service areas where spillage is a problem and cleanliness is essential, the Hakomatic will scrub clean and vacuum dry or buff and vacuum in one process.

Hako Minuteman automatic floor cleaning machines come in four different working widths (SBR 50, 20"; SBR 60, 24"; SBR 70, 28"; and SBR 85, 34"), and can cover up to 26,000 sq. ft. per hour. An alkaline cleaning solution softens dirt, fats, and other greasy food deposits; two counter-rotating disc-type brushes scrub it up; and than a strong vacuum motor and wet squeegee tool recover the dirty solution. The Hakomatic incorporates several unique features including an Electronic Battery Saver (EBS) which protects against machine damage when operated by unskilled workers. A red indicator light flashes when battery level drops to 20% of full charge. If the operator does not get to a charging station within ten minutes, the EBS automatically cuts power to the drive motor, preventing motor burn-out and costly replacement.

Other unique features include a swinging squeegee that easily recovers water at corners and under counters, and a water recovery system that operates in reverse as well as forward. The Hakomatic provides fast, easy, economical, and completely sanitary care for a wide variety of floors and floor coverings in commercial and institutional food service and supermarket environments.

Hako Minuteman is a broad-line manufacturer of vacuums, scrubbers, and carpet-care machines for commercial/industrial/institutional use.

For further information contact: Virginia Malisch, Marketing Communications Manager, Hako Minuteman, 111 South Route 53, Addition, IL 60101. Telephone 312-627-6900.

## *NSF Assessment Services*

The National Sanitation Foundation's Assessment Services program provides scientific and objective evaluations, analyses, special testing, and studies for government, manufacturers, trade associations, service companies, and individuals. Assessment services are being offered so that interested parties with products, services or needs not addressed by the Listing or Certification programs can take advantage of NSF's unique expertise and capabilities, group problem solving approach, and reputation for objectivity.

A new brochure describing the Assessment Services program is available free. Special evaluations, testing, and research are not new to NSF, but these activities are now identified as Assessment Services. The brochure lists examples of past and current assessment activities in the areas of drinking water, hazardous wastes, and onsite wastewater treatment systems, and in other areas related to public health and environment.

NSF is a non-profit organization best known for its public and environmental health standards, testing, listing programs for food equipment, plastic piping system components, wastewater treatment devices, and many other types of products.

Write to Assessment Services, National Sanitation Foundation, PO Box 1468, Ann Arbor, Michigan 48106 or phone 313-769-8010 for a free copy of "Facts about Assessment Services".

## Cultured Milk Product has New Look

Alta-Dena Certified Dairy has given Kefir, their cultured milk product, a brand new "flavorful" look and new package. A brilliant, milk-white polystyrene container sets off vivid, four-color photographics of 8 different fresh fruits used on the packages. The "labels" are actually printed on the container which adds greatly to shelf visibility and consumer appeal.

Kefir is a healthful drink with active cultures that has the zesty taste of yogurt and comes in convenient six-packs of the new handy 6-ounce container.

Boyd Clark, General Manager of the 32 year old dairy, commented, "We believe our new package will stand out on the dairy shelf and will add greatly to store sales because of its new fresh look and eye appeal. . .it really looks great".

The new package is being introduced in retail stores and supermarkets in California, and health food stores throughout the nation.

For product information, contact: Alta-Dena Certified Dairy, 17637 East Valley Blvd., City of Industry, California 91747.

## *Nominations Accepted for 82 National Service Award*

Nominations for the 1982 "National Service Award" are open to all practitioners of sanitation, according to David E. Meekings, chairman of the board, Environmental Management Association, the sponsoring organization of environmental management executives.

The rules are simple. Nominate an individual, or company, you believe has contributed to the movement for a cleaner and healthier place in which to live. . .a more beautiful America. Your nominee may be from any walk of life. . .from business, government or the general public.

The 1983 winner will be announced next March at EMA's mid-year educational conferences in Lancaster, Pennsylvania.

The association is looking for an individual or company who believes in the key role layed by sound environmental, sanitation and maintenance policies in enhancing our everyday quality of life, and has put that belief into action.

Nominations for the annual National Service Award should include a formal letter to the Environmental Management Association (1019 Highland Avenue, Largo, Florida 33540) detailing the nominee's background, qualifications and accomplishments.

The Food Sanitation Institute, a subsidiary of the Environmental Management Association, October 2-8, 1982 National Educational CONEXPO, Clearwater Beach, Florida 82 individual educational sessions and exposition will feature sanitation management, how-to, and technical subject presentations.

The 25th annual program, which includes a day at Walt Disney's Epcot Center (Orlando, Florida) the week of its opening, includes such important food sanitation and safety topics as in-house training programs, understanding and applying basic food law and food safety concepts, quality circles in increasing productivity, regulatory inspections of food plants, present and future, strengthening management skills and techniques, plant sanitation inspections, weed control, to where are we going with pesticides, regulatory reform, food transportation sanitation, cleaning of equipment and utensils, scheduling, establishing ones sanitation program to meet ones objectives training, insurance and pest management programs, hazardous waste regulations, and many more current and "look-into-the-future" food presentations.

Daniel A. Hayden, CPFS, (Lauhoff Grain Co., Danville, Illinois) president of the Food Sanitation Institute, EMA, has issued an invitation to all practitioners of food sanitation and safety to be in attendance.

# Refrigerated Railcar in Final Stages

Final engineering is underway on an innovative prototype refrigerated railcar that will preserve frozen food in transit through use of dry ice "snow" produced from liquid carbon dioxide supplied by a thermostatically controlled system on board the car.

Approximately $250,000 has been pledged to fund construction of the car -- the second phase of a research program investigating the use of liquid carbon dioxide refrigeration systems in railcars. The research program is being sponsored by the American Frozen Food Institute (AFFI) and the International Association of Refrigerated Warehouses (IARW). Contributions to fund construction of the car have come from forzen food processors that rely heavily on rail to ship their products, refrigerated warehouses, and railroads that handle frozen food shipments.

The Phase I part of the research effort, which began in 1980, invovled the modification of a mechanically refrigerated railcar owned by Burlington Northern Inc. Seven cross country test shipments, monitored in transit by members of the AFFI/IARW task force sponsoring the project and personnel from the Department of Agriculture's Transportation Research Laboratory, were highly successful. Product temepratures were below zero throughout the trips, and in all cases, the condition of the product upon arrival was excellent.

The cryogenic railcar research effort was undertaken because of a growing industry concern about the age, condition and future availability of mechanically refrigerated railcars, which are expensive to maintain and operate and which are not being replaced by U.S. railroads as they wear out. In 1975 there were 22,000 of the cars in service. By 1982, the number had dropped to 15,000 and by 1990 it is expected to drop to approximately 5,000.

Ralph P. Hill, vice president for distribution at Lamb Weston, Inc. and chairman of the AFFI/IARW research task force, called the response from industry to the fundraising effort for the construction of the Phase II car "gratifying and encouraging" and attributed it to recognition of the condition and future availability of mechanical cars, the success of the Phase I tests and the potential of the Phase II prototype car.

"The potential for liquid carbon dioxide refrigeration in railcars was established with the Phase I car. We had some very positive results, and those generated a great deal of interest from the industry. With the opportunity to build a Phase II car, where we are able to engineer in an on-board, thermostatically controlled carbon dioxide snow injection system, improved insulation and other innovations, we (the task force) believe we are going to produce a very effective, economical refrigerated railcar," Hill said.

The Phase II prototype car is being engineered and built by FGE, Inc., in their Alexandria, Virginia, shop and testing facility. FGE is contributing design and engineering services at no cost. The car will be equipped with a carbon dioxide refrigeration system by Concool Refrigeration Ltd., Montreal, Canada.

The Concool system will store liquid carbon dioxide at zero degrees Fahrenheit in a number of interconnected storage tanks beneath the floor of the car. The tanks will not only provide in-transit storage for the liquid carbon dioxide, but will also act as a barrier to heat entering the car and turn the floor into a giant "cold plate" to help keep the load at the desired temperature.

An initial blanket of carbon dioxide snow will be deposited on loads prior to departure from loading point. While in transit, the loads will receive additional charges of snow triggered by thermostatically controlled temperature sensors. Operation of the entire refrigeration system will require only the pneumatic power provided by the liquid carbon dioxide. No electrical or diesel power will be needed.

The car's side walls will be insulated with a compressed polyurethane foam that will help maximize energy efficiency. It will be painted with a reflective white paint, which will also help maximize energy efficiency, and will bear blue AFFI and IARW logos on the sides.

Final construction of the car will be completed by the end of the year. It will be owned by an independent, nonprofit shippers' association. This shippers' association, the American Frozen Food Cryogenic Association for Railcar Research -- (AFFCAR, Inc.) -- will determine the scheduling of the car, and handle other administrative details connected with its operation and maintenance.

Railroads moving frozen food have agreed to handle the car, which will be put into sustained research use after initial testing. Any frozen food processor will be eligible to apply to AFFCAR, Inc. to make test shipments in the car, though those that helped fund its construction will receive first priority.

For more information on the cryogenic railcar, contact: The American Frozen Food Institute, 1700 Old Meadow Road, Suite 100, McLean, Virginia 22102 or Ralph P. Hill, Vice President for Distribution, Lamb Weston, Inc., P.O. Box 23517, Portland, Oregon 97223.

## *Two-fold Mastitis Prevention Program*

A pair of new products for dairy cattle hygiene, PREP, a non-irritating udder wash, and PROTEK, a germicidal teat dip, have been introduced by the Monarch Chemicals Division of H. B. Fuller Company, St. Paul, Minnesota.

PREP udder wash and PROTEK teat dip were specifically developed to work together in a comprehensive mastitis prevention program.

Non-staining and non-irritating, PREP udder wash offers high detergency to help break up and remove soil. It has germicidal qualities to help control mastitis organisms on teat skin.

PROTEK teat dip is formulated with two active ingredients to control Staph, Strep, E. coli, and Pseudomonas bacteria. It has been shown in laboratory tests to kill 99.999 percent of major mastitis-causing organisms, even in the presence of excessive organic contamination.

Emollients in PROTEK help condition teat skin while enhancing natural defenses.

For more information, contact: Monarch Chemicals Division, 3900 Jackson Street NE, Minneapolis, MN 55421.

## New Drink Package Requires No Refrigeration

A new form of juice and drink packaging that requires no refrigeration, yet saves consumers and retailers both energy and money, has been introduced throughout much of the western U.S. for the first time by Ocean Spray Cranberries, Inc.

The Paper Bottle™, as the Plymouth, Mass. based marketing cooperative calls it, is an airtight flexible package, similar in shape to a small cereal box. The technology employed results in drinks and juices that require no preservatives, and keep for six months without refrigeration or freezing, whether in storage, transit, the store, or the consumer's home.

This innovative packaging system produces high quality drinks that taste identical to Ocean Spray's familiar product line in glass containers. In addition, juice/drinks in The Paper Bottle do not have the "tinny" taste often associated with canned drinks.

Benefits to the retailer will be even more significant with the advent of shelf-stable (non-frozen) liquid concentrates, which will eliminate the need for costly freezer space in the warehouse and store.

For more information contact: Christine M. Masclee, 617-747-1000.

## *Fruit Processing Facility Completed*

Southland Food Labs, a leading supplier of flavors, syrups, bases and concentrates for the dairy, bakery and food processing industries, has announced the completion of a new state-of-the-art aseptic fruit processing facility in its Dallas plant.

Southland indicated initial marketing of "Nature-Lock"™ aseptically processed fruit will be to producers of yogurt, ice cream and parfaits, although the fruit is ideal for use in pie fillings, danish toppings, and other food products. Aseptically processed fruit enjoys many "natural" attributes, including color which duplicates the original, a firm "mouth-feel" and retention of natural nutrients.

Southland Food Labs facility also includes high-speed "bag-in-box" packaging capabilities to reduce storage and transportation costs. Fruit processed and packaged in aseptic poly-metalized bags requires no refrigeration.

For more information contact: Southland Food Labs, 2841 Pierce Street, Dallas, Texas 75233. Phone: 800-627-6709.

## Embossed Butter Pats

Hotel and restaurants can emboss butter pats with their logos by using a hand-operated butter patting machine from Britain Designs, hand-carved onto wooden dies, the logos are stamped onto the butter pats as they are produced from 2-lb bulk supplies. A simple adjustment to the machine alters portion weights from 1/7 oz to 1 oz.

The machine can also be used by some food manufacturers who incorporate butter or margarine pats in products such as boil-in-the bag food packages.

Inquiries from prospective customers are welcomed by the agent. British co.: Butapatta Company Ltd., 10 Hartfield Road, Bexhill-on-Sea, East Sussex TN39 3EA England. Phone: Cooden (04243) 4339. US agent: J B Prince Co. (Contact: Mr. L. Prince), 64 W 36th Street, New York, NY 10018. Phone: 212-947-3991.

## *ALIMAC '83 in Bologna*

From February 10 to 13, 1983 the first ALIMAC, a fair of machines, equipments and food technologies will take place in Bologna.

This exhibition - gives an overall approach to the food sector problems and themes: raw materials preparation and transformation, quality-check, hygienic aspects, etc.

The show area will feature machines and equipments for the beverage industry and fruit and vegetable industry. A particular space will be devoted to the cold preservation techniques and to hygiene problems (washing and cleaning systems of plants and compounds employed) as well as to the use of additives in the food preparation and preservation.

ALIMAC '83 is a meeting of interest both for manufacturers and users.

For information please contact: senaf s.r.l., Segreterie: 40127 Bologna - Via Michelino, 69, Tel. (051) 503.318 (2 linee).

## Food Processing Technologies Combine

Internationally known Danish Turnkey Dairies Ltd., (DTD) of Aarhus, Denmark, announced the formation of a new U.S.-based subsidiary to provide high quality engineering and technology to America's dairy and food processing industry. The new venture involved bringing Integrated Processing Technologies Inc. (IPT), a new California company, into the DTD group of companies.

IPT, newly formed last January by Leonard Chapman, who will serve as president of IPT for the new joint venture, had already started building a high technology reputation in the food industry. Chapman most recently was Director of Planning and Operations at Alta-Dean Dairies, City of Industry, California. He stated, "This concept of combining food processing technologies from two continents and applying them to our American processing firms is a major move in our field. It's been done in some other industries", he continued, "but this will really be unique."

Chapman capsulized the new firm's direction and scope of activities, referring to IPT's idea of . . . "Total Concept Engineering". Chapman explained, "We are going to offer services ranging from feasibility studies and trouble-shooting to actual plant construction and startup activities. We'll specialize in renovations, retrofittings and new plant construction for the industry", he said. "American and Danish technology", he concluded, "represent the state of the art in this business and we hope to gain the same degree of success that DTD has enjoyed world-wide."

For more information, contact: Bill Solemene, 214-521-8050.

## QUICKLIP Ties Available

QUICKLIP ties grip securely, and can be instantly released by pulling the free end straight out from the closure head. QUICKLIPS can be used over and over again - unlke other ties which lose their effectiveness after several uses.

Four sizes of packaging ties are offered. These can be used for plastic or cloth bags from as small as 4" to as large as 32" in width.

QUICKLIP ties are now being used for packaging of foods, textiles, chemicals, plastic parts and dairy products.

For more information contact Lloyd Astmann, The Jilson Corporation, 200 Atlantic Street, Hackensack, NJ 07601, phone: 201-488-4646.

## *New Food Packaging Application*

A new nylon 6 film, monoaxially-oriented for exceptional cost/performance in multi-ply food packaging laminates, is now available from Allied Fibers & Plastics Company, Morristown, NJ. Capran® MDO is currently being tested as a cost-effective alternative to biaxially-oriented polyester in printed and nonprinted topwebs, pouches, and bags for snack food, candy, coffee, cheese, and wafer-sliced or other processed meats.

The new oriented nylon film is competitively priced with polyester films by weight; however, nylon's lower specific gravity results in an approximately 20% greater surface area yield. Thus food packagers can reduce their materials cost by using Carpran MDO.

Capran MDO has demonstrated excellent performance in holding tight print/reprint tolerances for multi-color printing. The new film is prefertially oriented in the machine direction and exhibits better stiffness, exceptional dimensional stability, and improved flex crack resistance when compared to unoriented nylon films.

The orienting process also improves the film's barrier qualities so that Capran MDO is superior to unoriented nylon. For added barrier properties, the new nylon film can be metallized and can be purchased from Allied with a PVDC coating.

Initial quantities of 48-, 60-, 75-, and 100-guage film are now available for customer sampling.

For further information on Capran MDO's performance in food packaging applications, contact Lynwood M. Edson, Food Industry Manager, Allied Fibers & Plastics Company, P.O. Box 2332R, Morristown, NJ 07960.

## AFFI Surveyed on Sodium

Forty-four (56 percent) of the 78 American Frozen Food Institute (AFFI) processor members that responded to a recent survey on sodium indicated they either plan to label or are already labeling the sodium content of some of their products.

Results of the survey -- which was conducted during spring, prior to the publication of FDA's proposed sodium regulation -- were presented July 28 to Food and Drug Administration (FDA) Commissioner Arthur Hull Hayes, Jr., M.D., by Edward R. Fencl, General Foods Corporation, chairman of AFFI's Sodium Task Force at a meeting at FDA headquarters in Rockville, Maryland.

Twenty-three companies (29 percent) said that they are already labeling the sodium content of their products. Some of the companies responding to the survey indicated that they did not feel sodium labeling was necessary on their products because the products contain almost no sodium or sodium in very low quantities.

Of the 23 companies that indicated they are currently labeling the sodium content of some of their products, nine said these products represent over 75 percent of their total product volume, while two said the sodium-labeled products represent 50 to 75 percent of total product volume. Six companies said that products bearing sodium labeling represent 25 to 50 percent of their total product volume, and the rest said these products represent less than 25 percent of total product volume.

Almost three-fourths (68 percent) of the companies indicating that they produce private label products said that their customers are either very likely or somewhat likely to ask for sodium labeling at some time in the future.

Twenty-five of the companies (32 percent) indicated that they plan to make sodium reductions and/or substitutions in some of their products. Three of these said that such reductions and/or substitutions would be made in products representing over 75 percent of their total product volume, one said that the reductions and/or substitutions would be made in products representing 50 to 75 percent of their total volume, and six said the reductions and/or substitutions would be made in products representing 25 to 50 percent of their total volume. The rest said that such reductions and/or substitutions would be made in products representing less than 25 percent of their total product volume.

The presentation of the survey data at the July 28 meeting with Commissioner Hayes was part of AFFI's continuing dialogue with FDA on sodium, which began in September 1981 when Hayes outlined his plan for voluntary sodium labeling and reduction at a meeting of several of AFFI's committees in Washington. At that meeting, AFFI established a Sodium Task Force that met with the Commissioner in October. Following the October meeting, AFFI's Board of Directors adopted a policy supporting the idea of voluntary sodium labeling and sodium content reduction where practical.

## 82 Whey Products Conference Location Changed

The location of the *1982 Whey Products Conference*, sponsored jointly by the Whey Products Institute and the U.S. Department of Agriculture/Eastern Regional Research Center, has been changed to the *Hyatt Regency Woodfield, Schaumburg (Chicago O'Hare area), IL.* The dates for the Conference, Thursday-Friday, October 21-22, 1982, will remain the same. It was earlier announced that the Conference would be held at The Hamilton Hotel, Itasca, IL.

The Conference will bring together manufacturers of whey and whey products, firms manufacturing equipment used in whey processing, business leaders of the industry, and government and university representatives to discuss current topics of interest relating to whey production, research, marketing and utilization.

Persons interested in attending the *1982 Whey Products Conference* should contact: Dr. Warren S. Clark, Jr., Executive Director, Whey Products Institute, 130 N. Frankling Street, Chicago, IL 60606.

## *Pack Expo '82*

At Pack Expo '82, to be held in Chicago's McCormick Place on November 16 through 18, packaging professionals will have the opportunity to learn of the many similarities between marketing and packaging. There will be sessions on design, communications, strategic planning and other tools of marketing that can be adapted to the needs of packagers.

There will be 48 concurrent sessions at Pack Expo running two tiers each morning. The first tier will run from 9:00 to 10:30 a.m. and the second from 11:00 a.m. to 12:30 p.m. In addition there will be two plenery sessions from 1:00 until 2:00 p.m. on Tuesday and Wednesday, November 16 and 17.

The meeting schedule was arranged so that attendees will have the afternoon free to visit the more than 600 exhibitors who have a taken a record 475,000 square feet of display space. Decision makers in the machinery area can see the very latest in equipment as well as in materials at the show. Pack Expo '82 will be the largest packaging show to be held in the United States this year.

Pack Expo '82 is sponsored by American Management Associations, Packaging Education Foundation, Packaging Institute/USA, Packaging Machinery Manufacturers Institute and the Society of Packaging and Handling Engineers.

# Holders of 3-A Symbol Council Authorizations on August 20, 1982

**Questions or statements concerning any of the holders of authorizations listed below, or the equipment fabricated, should be addressed to Earl O. Wright, Sec'y.-Treas., P.O. Box 701, Ames, Iowa 50010-0701.**

### 01-06 Storage Tanks for Milk and Milk Products

28 Cherry-Burrell Corporation (10/ 3/56)
(unit AMCA Int'l)
575 E. Mill St.
Little Falls, New York 13365

102 Chester-Jensen Company, Inc. ( 6/ 6/58)
5th & Tilgham Streets
Chester, Pennsylvania 19013

2 CREPACO, Inc. ( 5/ 1/56)
100 C.P. Avenue
Lake Mills, Wisconsin 53551

117 DCI, Inc. (10/28/59)
St. Cloud Industrial Park
St. Cloud, Minnesota 56301

76 Damrow Company (10/31/57)
Div. of Dec. International, Inc.
196 Western Avenue
Fond du Lac, Wisconsin 54935

115 DeLaval Company, Ltd. ( 9/28/59)
113 Park Street South
Peterborough, Ontario, Canada
(not available in USA)

109 Girton Manufacturing Company ( 9/30/58)
State Street
Millville, Pennsylvania 17846

127 Paul Mueller Company ( 6/29/60)
P.O. Box 828
Springfield, Missouri 65801

31 Walker Stainless Equipment Co. (10/ 4/56)
Elroy, Wisconsin 53929

### 02-08 Pumps for Milk and Milk Products

325 Albin Pump Inc. (12/19/79)
(Mfg. by Albin Motor Aktiebolag)
1260 Winchester Parkway
Smyrna, Georgia 30080

214R Ben H. Anderson Manufacturers ( 5/20/70)
Morrisonville, Wisconsin 53571

212R Babson Bros. Co. ( 2/20/70)
2100 S. York Rd.
Oak Brook, Illinois 60621

29R Cherry-Burrell Corporation (10/ 3/56)
(unit AMCA Int'l)
2400 Sixth St., Southwest
Cedar Rapids, Iowa 52406

63R CREPACO, Inc. ( 4/29/57)
100 CP Avenue
Lake Mills, Wisconsin 53551

205R Dairy Equipment Company ( 5/22/69)
1919 South Stoughton Road
Madison, Wisconsin 53716

358 Evro Johnson Pumps Limited ( 5/18/82)
(not available in USA)
Powdermill Lane, Dartford
Kent, England

65R G & H Products, Inc. ( 5/22/57)
5718 52nd Street
Kenosha, Wisconsin 53140

363 E. C. Smith and Assoc., Inc. ( 7/28/82)
(Mfg. by The Howard Pump Co. Ltd.)
60 East 42nd St.
New York, NY 10165

145R ITT Jabsco Incorporated (11/20/63)
145 Dale Way
Costa Mesa, California 92626

348 ITT MARC Division, England (12/ 3/81)
ITT Jabsco Limited
3200 Bristol-Suite 710
Costa Mesa, CA 92626

314 Len E. Ivarson, Inc. (12/22/78)
3100 W. Green Tree Road
Milwaukee, Wisconsin 53223

26R Ladish Co., Tri-Clover Division ( 9/29/56)
9201 Wilmot Road
Kenosha, Wisconsin 53140

319 Mono Group, Inc. ( 3/21/79)
(Mfg. by SSP Pumps Ltd.)
847 Industrial Drive
Bensonville, IL 60106

241 Puriti S. A. ( 9/12/72)
Alfredo Noble #39, Industrial Pte. de Vigas
Tlalnepantla, Mexico
(not available in USA)

148 Robbins & Myers, Inc. ( 4/22/64)
1895 W. Jefferson St.
Springfield, OH 45506

306 Stamp Corp. ( 5/ 2/78)
2410 Parview Road
Middleton, WI 53562

332 Superior Stainless, Inc. (12/10/80)
211 Sugar Creek Rd.
Delavan, WI 53115

72R L. C. Thomsen & Sons, Inc. ( 8/15/57)
1303 43rd Street
Kenosha, Wisconsin 53140

219 Tri-Canada Inc. ( 2/15/71)
P.O. Box 4589
Buffalo, NY 14240

175R Universal Milking Machine Div. (10/26/56)
Universal Cooperatives, Inc.
408 South First Ave.
Albert Lea, MN 56007

329 Valex Products Corp. ( 6/10/80)
20447 Nordhoff St.
Chatsworth, Calif. 91311

52R Viking Pump Div. (12/31/56)
Houdaille Industries, Inc.
406 State Street
Cedar Falls, Iowa 50613

5R Waukesha Foundry Company ( 7/ 6/56)
1300 Lincoln Ave.
Waukesha, Wisconsin 53186

**04-03 Homogenizers and High Pressure Pumps of the Plunger Type**

344 ALFA-LAVAL, Inc. ( 8/24/81)
2115 Linwood Avenue
Ft. Lee, New Jersey 07024

247 Bran and Lubbe, Inc. ( 4/14/73)
512 Northgate Parkway
Wheeling, IL 60090

87 Cherry-Burrell Company (12/20/57)
(unit AMCA Int'l)
2400 Sixth Street, Southwest
Cedar Rapids, Iowa 52404

37 CREPACO, Inc. (10/19/56)
100 CP Avenue
Lake Mills, Wisconsin 53538

75 Gaulin, Inc. ( 9/26/57)
44 Garden Street
Everett, Massachusetts 02149

237 Graco Inc. ( 6/ 3/72)
P.O. Box 1441
Minneapolis, Minnesota 55440

309 General Dairy Equipment ( 7/19/78)
(Mfg. by Rannie A/S, Denmark)
434 Stinson Boulevard
Minneapolis, Minnesota 55413

256 Liquipak International, Inc. ( 1/23/74)
2285 University Avenue
St. Paul, Minnesota 55114

**05-13 Stainless Steel Automotive Milk Transportation Tanks for Bulk Delivery and/or Farm Pick-up Service**

70R Brenner Tank, Inc. ( 8/ 5/57)
450 Arlington
P.O. Box 670
Fond du Lac, Wisconsin 54935

40 Transportation Equipment Corporation (10/20/56)
900 Sixth Ave., Southeast
Minneapolis, Minnesota 55114

66 Dairy Equipment Company ( 5/29/57)
1919 South Stoughton Road
Madison, Wisconsin 53716

45 The Heil Company (10/26/56)
3000 W. Montana Street
Milwaukee, Wisconsin 53235

297 Indiana Tank Co., Inc. ( 8/29/77)
P.O. Box 366
Summitville, Indiana 46070

305 Light Industrial Design Co. ( 3/23/78)
8631-A Depot Road
Lynden, WA 98264

338 Murphy's Inc. (4/20/81)
P.O. Box 18
Avon, MN 56310

201 Paul Krohnert Mfg., Ltd. ( 4/ 1/68)
811 Steeles Avenue
Milton, Ontario, Canada L9T 2Y3
(not available in USA)

85 Polar Tank Trailer, Inc. (12/20/57)
Holdingford, Minnesota 56340

47 Pullman Trailmobile (11/ 2/56)
701 East 16th Avenue
North Kansas City, Missouri 64116

121 Technova Inc. Gosselin Division (12/ 9/59)
1450 Hebert c.p. 758
Drummondville, Quebec, Canada J2C 2A1
(not available in USA)

189 A. & L. Tougas, Ltee (10/ 3/66)
1 Tougas St.
Iberville, Quebec, Canada
(not available in USA)

25 Walker Stainless Equipment Co. ( 9/28/56)
New Lisbon, Wisconsin 53950

**08-17 Fittings Used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products**

291 Accurate Metering Systems, Inc. ( 6/22/77)
1731 Carmen Drive
Elk Grove Village, IL 60007

79R Alloy Products Corporation (11/23/57)
1045 Perkins Avenue
Waukesha, Wisconsin 53186

349 A.P.N., Inc. (12/15/81)
400 West Lincoln
Caledonia, MN 55921

245 Babson Brothers Company ( 2/12/73)
2100 South York Road
Oak Brook, Illinois 60521

284 Bristol Engineering Company (11/18/76)
210 Beaver Street
Yorkville, Illinois 60560

301 Brown Equip. Co., Inc. (12/ 6/77)
9955-9¼ Ave.
Hanford, California 93230

82R Cherry-Burrell Company (12/11/57)
(unit AMCA Int'l)
2400 Sixth Street, Southwest
Cedar Rapids, Iowa 52406

260 CREPACO, Inc. ( 5/22/74)
100 CP Avenue
Lake Mills, Wisconsin 53551

322 ALFA-LAVAL LIMITED ( 7/16/79)
(not available in USA)
113 Park St. So.
Peterborough, Ontario
Canada K9J 3R8

304 VNE Corp. ( 3/16/78)
(Mfg. by Egmo Ltd.-Israel)
1415 Johnson St., P.O. Box 187
Janesville, WI 53545

271 The Foxboro Company ( 3/ 8/76)
Neponset Street
Foxboro, Massachusetts 02035

67R G & H Products, Inc. ( 6/10/57)
(Some Models Mfg. by Alfa-Laval AB-Sweden)
5718 52nd Street
Kenosha, Wisconsin 53140

203R ITT-Grinnell Company, Inc. (11/ 7/68)
DIA-FLO Div
33 Centerville Rd.
Lancaster, Pennsylvania 17603

34R Ladish Co., Tri-Clover Division (10/15/56)
9201 Wilmot Road
Kenosha, Wisconsin 53140

350 Rosista, Inc. ( 1/ 7/82)
808 North Central Avenue
P.O. Box 685
Wood Dale, IL 60191

287 Sanitary Processing Equipt. Corp. ( 1/14/77)
(Mfg. by Koltek OY-Finland)
P.O. Box 26
Dewitt, New York 13214

239 LUMACO ( 6/30/72)
Box 688,
Teaneck, New Jersey 07666

200R Paul Mueller Co. ( 3/ 5/68)
P.O. Box 828
Springfield, Missouri 65801

295 Precision Stainless Products ( 8/11/77)
(Mfg. by Toyo Stainless Co. Ltd.)
5636 Shull St.
Bell Gardens, CA 90201

242 Puriti, S.A. ( 9/12/72)
Alfredo Nobel #39 Industrial Pte de Vigas
Tlalnepantla, Mexico
(not available in USA)

149R Q Controls ( 5/18/64)
Occidental, California 95465

334 Stainless Products Inc. (12/18/80)
1649 72nd Ave., Box 169
Somers, WI 53171

73R L. C. Thomsen & Sons, Inc. ( 8/31/57)
1303 43rd Street
Kenosha, Wisconsin 53140

300 Superior Stainless, Inc. (11/22/77)
211 Sugar Creek Rd.
Delavan, Wisconsin 53115

357 Tanaco Products ( 4/15/82)
3860 Loomis Trail
Blaine, Washington 98230

191R Tri-Canada, Ltd. (11/23/66)
P.O. Box 4589
Buffalo, NY 14240

250 Universal Milking Machine ( 6/11/73)
Div. of Universal Cooperatives
407 First Ave, So.
Albert Lea, Minnesota 56007

278 Valex Products ( 8/30/76)
20447 Nordhoff St.
Chatsworth, California 91311

86R Waukesha Specialty Company, Inc. (12/20/57)
Darien, Wisconsin 53114

**09-07 Instrument Fittings and Connections Used on Milk and Milk Products Equipment**

321 Anderson Instrument Co., Inc. ( 6/14/79)
R.D. #1, Fultonville, New York 12072

315 Burns Engineering, Inc. ( 2/ 5/79)
10201 Bren Road, East
Minnetonka, MN 55343

206 The Foxboro Company ( 8/11/69)
Neponset Avenue
Foxboro, Massachusetts 02035

285 Tank Mate Company (12/ 7/76)
2269 Ford Parkway
St. Paul, Minnesota 55116

32 Taylor Instrument Process Control (10/ 4/56)
Div. Sybron Corporation
95 Ames Street
Rochester, New York 14601

**10-00 Milk and Milk Products Filters Using Disposable Filter Media, As Amended**

35 Ladish Co., Tri-Clover Division (10/15/56)
9201 Wilmot Road
Kenosha, Wisconsin 53140

296 L. C. Thomsen & Sons, Inc. ( 8/15/77)
1303 43rd St.
Kenosha, Wisconsin 53140

**11-03 Plate-type Heat Exchangers for Milk and Milk Products**

316 Agric Machinery Corp. ( 2/ 7/79)
P.O. Box 6
Madison, NJ 07940

326 American Vicarb Corporation (2/ 4/80)
(Mfg by Vicarb S. A. France)
1522 Main Street
Niagra Falls, N.Y. 14301

20 A.P.V. Equipment, Inc. ( 9/ 4/56)
395 Fillmore Avenue
Tonawanda, New York 14150

30 Cherry-Burrell Corporation (10/ 1/56)
(unit AMCA Int'l)
2400 Sixth Street, Southwest
Cedar Rapids, Iowa 52404

14 Chester-Jensen Co., Inc. ( 8/15/56)
5th & Tilgham Streets
Chester, Pennsylvania 19013

38 CREPACO, Inc. (10/19/56)
100 CP Avenue
Lake Mills, Wisconsin 53551

120 ALFA LAVAL, Ltd. (12/ 3/59)
113 Park Street
South Peterborough, Ontario, Canada

342 General Dairy Equipment Co. (7/6/81)
(Mfg. by Pasilak-Therm, Denmark)
437 Harding Street, N.E.
Minneapolis, MN 55413

279 The Schluter Co. ( 8/29/76)
(Mfg. by Samuel Parker Ltd.)
112 E. Centerway
Janesville, WI 53545

17 ALFA-LAVAL, Inc. ( 8/30/56)
(Mfg. in Sweden)
2115 Linwood Ave.
Ft. Lee, New Jersey 07024

362 Kraeze Dairy Equipment, Inc. ( 7/20/82)
14393 Euclid Avenue
Chino, CA 91710

15 Kusel Equipment Company ( 8/15/56)
P.O. Box 87
820 West Street
Watertown, Wisconsin 53094

360 Laffranchi Manufacturing Co. ( 7/12/82)
P.O. Box 455
Ferndale, CA 95536

### 12-04 Tubular Heat Exchangers, for Milk and Milk Products

248 Allegheny Bradford Corporation ( 4/16/73)
P.O. Box 264
Bradford, Pennsylvania 16701

243 Babson Brothers Company (10/31/72)
2100 S. York Road
Oak Brook, Illinois 60521

103 Chester-Jensen Company, Inc. ( 6/ 6/58)
5th & Tilgham Street
Chester, Pennsylvania 19013

307 G&H Products, Inc. ( 5/ 2/78)
5718-52nd St.
Kenosha, WI 53141

217 Girton Manufacturing Co. ( 1/23/71)
Millville, Pennsylvania 17846

252 Ernest Laffranchi (12/27/73)
P.O. Box 455
Ferndale, California 95536

238 Paul Mueller Company ( 6/28/72)
P.O. Box 828
Springfield, Missouri 65801

96 C. E. Rogers Company ( 3/31/64)
South Highway #65
P.O. Box 188
Mora, Minnesota 55051

### 13-06 Farm Milk Cooling and Holding Tanks

240 Babson Brothers Company ( 9/ 5/72)
2100 S. York Road
Oak Brook, Illinois 60521

11R CREPACO, Inc. ( 7/25/56)
100 CP Ave.
Lake Mills, Wisconsin 53551

119R DCI, Inc. (10/28/59)
St. Cloud Industrial Park
St. Cloud, Minnesota 56301

4R Dairy Equipment Company ( 6/15/56)
1919 South Stoughton Road
Madison, Wisconsin 53716

92R Alfa-Laval Limited (12/27/57)
113 Park Street South
Peterborough, Ontario Canada

49R Alfa Laval, Inc. (12/ 5/56)
(DeLaval Agricultural Division)
(Mfg. by Alfa-Laval, Canada)
11100 N. Congress Ave.
Kansas City, Missouri 64153

10R Girton Manufacturing Company ( 7/25/56)
Millville, Pennsylvania 17846

356 Meyer D. Haberer ( 2/3/81)
P. O. Box 220
Bowdle, S.D. 57428

179R Heavy Duty Products (Preston), Ltd. ( 3/ 8/66)
1261 Industrial Road
Preston, Ontario, Canada
(not available in USA)

12R Paul Mueller Company ( 7/31/56)
P.O. Box 828
Springfield, Missouri 65801

16R Zero Manufacturing Company ( 8/27/56)
Washington, Missouri 63090

### 16-04 Evaporators and Vacuum Pans for Milk and Milk Products

254 Anhydro, Inc. ( 1/ 7/74)
165 John Dietsch Square
Attleboro Falls, Massachusetts 02763

132R A.P.V. Company, Inc. (10/26/60)
Tonawanda Industrial Park
395 Fillmore Ave.
Tonawanda, New York 14150

107R C. E. Rogers Company ( 8/ 1/58)
South Highway #65
P.O. Box 118
Mora, Minnesota 55051

277 Alfa Laval Contherm Division ( 8/19/76)
Route 1 Rotary, PO Box 352
Newburyport, MA 01950

356 Damrow Co., Div. of DEC Int. ( 3/18/82)
196 Western Ave.
Fond du Lac, Wis. 54935

186R Marriott Walker Corporation ( 9/ 6/66)
925 East Maple Road
Birmingham, Michigan 48010

273 Niro Atomizer Inc. ( 5/20/76)
1600 County Rd F.
Hudson, WI 54016

299 Stork Food Machinery, Inc. (11/16/77)
(Mfg. by Stork-Friesland B.V.)
P.O. Box 816
Somerville, New Jersey 08876

311 Wiegand Evaporators, Inc. ( 8/28/78)
5585 Sterrett Place
Columbia, Maryland 21044

### 17-06 Fillers and Sealers of Single Service Containers For Milk and Milk Products

346 B-Bar-B, Inc. (10/20/81)
E. 10th & McBeth Streets
P.O. Box 909
New Albany, IN 47150

351 BRIK PAK INC. ( 1/ 7/82)
2775 Villa Creek
Suite 165-D
Dallas, TX 75234

192 Cherry-Burrell Corporation ( 1/ 3/67)
(unit AMCA Int'l)
2400 Sixth St., Southwest
Cedar Rapids, IA 52404

324 Continental Can Co., USA ( 4/15/82)
(Mfg. by ERCA, France)
711 Jorie Blvd.
Oak Brook, Ill. 60521

137 Ex-Cell-O Corporation (10/17/62)
2855 Coolidge,
Troy, Michigan 48084

352 GMS Engineering ( 1/12/82)
(Sweetheart Plastics)
1936 Sherwood St.
Clearwater, FL 33515

220 Liquipak International, Inc. ( 4/24/71)
2285 University Ave.
St. Paul, Minnesota 55114

330 Milliken Packaging ( 8/26/80)
(Mfg. by Chubukikai Co. Ltd.)
White Stone, South Carolina 29353

281 Purity Packaging Corporation (11/ 8/76)
800 Kederly Drive
Columbus, Ohio 43228

211 Twin-Pak Inc. (Canada) ( 2/ 4/70)
(Mfg. by Thimonnier & Cie, France)
Steel & Cohen, 745 Fifth Ave.
New York, New York 10022

**19-03 Batch and Continuous Freezers, For Ice Cream, Ices and Similarly Frozen Dairy Foods, As Amended**

286 O.G. Hoyer, Inc. (12/ 8/76)
201 Broad St.
Lake Geneva, WI 53147
(Mfg. by O.G. Hoyer A/S of Denmark)

146 Cherry-Burrell Company (12/10/63)
(unit AMCA Int'l)
2400 Sixth Street, Southwest
Cedar Rapids, Iowa 52404

141 CREPACO, Inc. ( 4/15/63)
100 CP Avenue
Lake Mills, Wisconsin 53551

355 Emery Thompson Machine and Supply Co. ( 3/ 9/82)
1349 Inwood Avenue
Bronx, NY 10452

**22-04 Silo-Type Storage Tanks for Milk and Milk Products**

168 Cherry-Burrell Corporation ( 6/16/65)
(unit AMCA Int'l)
575 E. Mill St.
Little Falls, New York 13365

154 CREPACO, Inc. ( 2/10/65)
100 CP Avenue
Lake Mills, Wisconsin 53551

160 DCI, Inc. ( 4/ 5/65)
St. Cloud Industrial Park
St. Cloud, Minnesota 56301

181 Damrow Company, Division of DEC ( 5/18/66)
International, Inc., 196 Western Ave.
Fond du Lac, Wisconsin 54935

262 DeLaval Company Ltd., Canada (11/11/74)
113 Park Street South
Peterborough, Ontario Canada

155 Paul Mueller Co. ( 2/10/65)
P.O. Box 828
Springfield, Missouri 65801

312 Sanitary Processing Equip. Corp. ( 9/15/78)
P.O. Box 26
Dewitt, New York 13208

165 Walker Stainless Equipment Co. ( 4/26/65)
Elroy, Wisconsin 53929

**23-01 Equipment for Packaging Frozen Desserts, Cottage Cheese and Milk Products Similar to Cottage Cheese in Single Service Containers**

174 Anderson Bros. Mfg. Co. ( 9/28/65)
1303 Samuelson Road
Rockford, Illinois 61109

209 Doboy Packaging Machinery Division ( 7/23/69)
of Nordson Corporation, 215 N. Knowles Ave.
New Richmond, Wisconsin 54017

302 Eskimo Pie Corp. ( 1/27/78)
530 E. Main St.
Richmond, Virginia 23219

343 O. G. Hoyer, Inc. ( 7/ 6/81)
(Mfg. by O. G. Hoyer, Denmark)
201 Broad Street
Lake Geneva, Wis. 53147

**24-00 Non-Coil Type Batch Pasteurizers**

161 Cherry-Burrell Corporation ( 4/ 5/65)
(unit AMCA Int'l)
575 E. Mill St.
Little Falls, New York 13365

158 CREPACO, Inc. ( 3/24/65)
100 CP Avenue
Lake Mills, Wisconsin 53551

187 DCI, Inc. ( 9/26/66)
St. Cloud Industrial Park
St. Cloud, Minnesota 56301

166 Paul Mueller Co. ( 4/26/65)
P.O. Box 828
Springfield, Missouri 65601

**25-00 Non-Coil Type Batch Processors for Milk and Milk Products**

162 Cherry-Burrell Corporation ( 4/ 5/65)
(unit AMCA Int'l)
575 E. Mill St.
Litlle Falls, New York 13365

159 CREPACO, Inc. ( 3/24/65)
100 CP Avenue
Lake Mills, Wisconsin 53551

188 DCI, Inc. ( 9/26/66)
St. Cloud Industrial Park
St. Cloud, Minnesota 56301

177 Girton Manufacturing Co. ( 2/18/66)
Millville, PA 17846

167 Paul Mueller Co. ( 4/26/65)
Box 828
Springfield, Missouri 65801

202 Walker Stainless Equipment Co. ( 9/24/68)
New Lisbon, Wisconsin 53950

**26-01 Sifters for Dry Milk and Dry Milk Products**

229 Russell Finex Inc. ( 3/15/72)
156 W. Sandford Boulevard
Mt. Vernon, New York 10550

173 B. F. Gump Division ( 9/20/65)
Blaw-Knox Food & Chem. Equip. Inc.
750 E. Ferry St., P.O. Box 1041
Buffalo, NY 14211

185 Rotex, Inc. ( 8/10/66)
(Mfg. by Orville Simpson Co.)
1230 Knowlton St.
Cincinnati, Ohio 45223

363 Kason Corporation ( 7/28/82)
231 Johnson Avenue
Newark, NJ 07108

176 Koppers Company, Inc. ( 1/ 4/66)
Metal Products Division
Sprout-Waldron Operation
Munsy, Pennsylvania 17756

172 SWECO, Inc. ( 9/ 1/65)
P.O. Box 4151
6033 E. Bandini Blvd.
Los Angeles, California 90051

**27-01 Equipment for Packaging Dry Milk and Dry Milk Products**

353 All-Fill Inc., Great Valley Corp. Center ( 3/ 2/82)
40 Forest Valley Pkwy. C.B10
Malvern, PA 19355

313 WPM Systems, Inc. (10/10/78)
Div. of St. Regis Paper Company
4990 Acoma St.
Denver, Colorado 80216

347 Hubbard Consultants, Inc. (10/28/81)
1531 B West Irving Park Rd.
Suite 211
Itasca, IL 60143

**28-00 Flow Meters for Milk and Liquid Milk Products**

272 Accurate Metering Systems, Inc. ( 4/ 2/76)
(RZ2A Mgf. by Diessel GmbH-Germany)
1731 Carmen Drive
Elk Grove Village, Illinois 60007

253 Badger Meter, Inc. ( 1/ 2/74)
4545 W. Brown Deer Road
Milwaukee, Wisconsin 53223

223 C-E IN-VAL-CO, Division of Combustion (11/15/71)
Engineering, Inc.
P.O. Box 556, 3102 Charles Page Blvd.
Tulsa, Oklahoma 74101

359 Emerson Electric Company ( 6/10/82)
Brooks Instrument Div.
P.O. Box 450 North 301
Statesboro, GA 30458

265 Electronic Flo-Meters, Inc. ( 3/10/75)
P.O. Box 38269
Dallas, TX 75239

226 Fischer & Porter Co. (12/9/71)
Magnetic Flowmeters
Dept. 372 County Line Road
Warminster, Pa. 18974

224 The Foxboro Company (11/16/71)
Neponset Avenue
Foxboro, Massachusetts 02035

320 Max Machinery, Inc. ( 3/28/79)
1420 Healdsburg Ave.
Healdsburg, CA 95448

270 Taylor Instrument Company Division ( 2/ 9/76)
Sybron Corporation, 95 Ames Street
Rochester, New York 14601

**29-00 Air Eliminators for Milk and Fluid Milk Products**

340 Accurate Metering Systems (6/2/81)
(Mfg. by Diessel GmbH-Germany)
1731-33 Carmen Drive
Elk Grove Village, IL 60007

**30-00 Farm Milk Storage Tanks**

257 Babson Bros. Co. ( 2/ 7/74)
(Mfg. by CREPACO, Inc.)
2100 S. York Road
Oak Brook, Illinois 60521

**31-00 Scraped Surface Heat Exchangers**

274 Contherm Corporation ( 6/25/76)
P.O. Box 352
Newburyport, Massachusetts 01950

322 Cherry Burrell ( 7/26/79)
2400 6th St. SW
Cedar Rapids, IA 52406

290 CREPACO, Inc. ( 6/15/77)
100 So. CP Ave.
Lake Mills, WI 53551

361 Damrow Company ( 7/12/82)
A Division of DEC International, Inc.
196 Western Ave.
Fond du Lac, Wisconsin 54935

**32-00 Uninsulated Tanks for Milk and Milk Products**

264 Cherry-Burrell Company, ( 1/27/75)
(unit AMCA Int'l)
575 E. Mill St.
Little Falls, NY 13365

268 DCI, Inc. (11/21/75)
P.O. Box 1227
St. Cloud, Minnesota 56301

354 C. E. Rogers Co. ( 3/ 3/82)
South Highway #65
Mora, MN 55051

339 Walker Stainless Equipment Co., Inc. (6/2/81)
601 State Street
New Lisbon, WI 53950

**33-00 Polished Metal Tubing for Dairy Products**

310 Allegheny Bradford Corporation ( 7/19/78)
P.O. Box 264
Bradford, PA 16701

289 Ladish Co., Tri-Clover Division ( 1/21/77)
9201 Wilmot Road
Kenosha, Wisconsin 53140

308 Rath Mfg. Co. Inc. ( 6/15/77)
2505 Foster Ave.
Janesville, WI 53545

335 Stainless Products Inc. ( 1/4/81)
1649-72nd Ave., P.O. Box 169
Sumers, WI 53171

345 Trent Tube Division Crucible, Inc. ( 9/16/81)
2188 S. Church St.
East Troy, WI 53120

331 United Industries Incorporated (10/23/80)
1546 Henry Ave.
Beloit, WI 53511

**35-00 Continuous Blenders**

292 Waukesha Division, Abex Corp. ( 8/24/77)
1300 Lincoln Ave.
Waukesha, WI 53186

**36-00 Colloid Mills**

293 Waukesha Division, Abex Corp. ( 8/24/77)
1300 Lincoln Ave.
Waukesha, WI 53186

**37-00 Pressure and Level Sensing Devices**

318 Anderson Instrument Co., Inc. ( 4/ 9/79)
R.D. #1 Fultonville, N.Y. 12072

317 C-E Invalco Division of Combustion Engineering, Inc.
P.O. Box 556
Tulsa, OK 74101
( 2/26/79)

328 Rosemount, Inc.
12001 West 78th St.
P.O. Box 35129
Eden Prairie, MN 55344
( 5/22/80)

# Calendar

**1982**

Sept. 20-22---INDIANA ASSOC. OF SANITARIANS MEETING. French Lick Springs Golf & Tennis Resort. French Lick, IN 47432. For more information contact: Tami Barrett, 1330 W. Michigan St., Indianapolis, IN 46206.

Sept. 21-23---NEW YORK STATE ASSOCIATION OF MILK AND FOOD SANITATION ANNUAL MEETING. Sheraton Inn, Syracuse, NY. For more information contact: David Bandler, Stocking Hall, Cornell University, Ithaca, NY 14853.

Sept. 23-24---FOOD SAFETY LAWS: DELANEY AND OTHER DILEMMAS. Capital Hilton, Washington, DC. For more information contact: Elizabeth M. Ollen, Boston University School of Public Health School of Medicine, 80 East Concord St., Boston, MA 02118, 617-247-6102.

Sept. 27-28---MIDWEST FOOD PROCESSING CONFERENCE. Hyatt-Regency Hotel on Nicollet Mall. Minneapolis, MN. For more information contact: Midwest Food Processing Conference, 136g ABLMS, 1354 Eckles Avenue, University of Minnesota, St. Paul, MN 55108.

Sept. 29-30---SOUTH DAKOTA STATE DAIRY CONVENTION, Downtown Holiday Inn, Sioux Falls, SD. Shirley W. Seas, secretary, Dairy Science Dept., South Dakota State University, Brookings, SD 57007.

Sept. 30 - CENTRAL WISCONSIN CHEESEMAKERS', BUTTERMAKERS' AND DAIRYMEN'S ADVANCEMENT ASSOCIATION, ANNUAL MEETING. Terry Eggebrecht, Rt. 2, Box 567, Colby, WI 54421.

Oct. 5-6---DAIRY INDUSTRY CONFERENCE. Sponsored by CADMS and California Dairy Industry Association. Plaza Airport Inn, Millbrae, CA. For more information contact: Joseph M. Cardoza, Sec.-CADMS, 280 Salsbury Dr., Santa Clara, CA 95051.

Oct. 5-7---MISSOURI BUTTER AND CHEESE INSTITUTE, EDUCATIONAL CONFERENCE AND CONVENTION, Hilton Inn of the Ozarks, Springfield, MO. Dale Gardner, executive secretary, #3 Overbrook Dr., Kirksville, MO 63501.

Oct. 6---SOUTHEASTERN WISCONSIN CHEESE ASSOCIATION, ANNUAL CONVENTION, Woodridge Restaurant and Cocktail Lounge. Hartford, WI. For more information contact: Art Loehr, secretary-treasurer, St. Cloud, WI 53079.

Oct. 6---60th ANNUAL JAMBOREE, The Pioneer Dairymen's Club of America, Edgewood Supper Club, Cannon Falls, MN. For more information contact: Elmer Leppen, secretary, 1816 Duncan Rd., Bloomer, WI 54724.

Oct. 6-8---KANSAS ASSOCIATION OF SANITARIANS ANNUAL MEETING, Sheraton Inn, Wichita Airport, Wichita,KS. For more information contact: John MItchell, KS Dept. of Health and Environment, Forbes Field, Topeka, KS 66609.

Oct. 7-8---1982 SYMPOSIUM ON STATISTICS IN THE ENVIRONMENTAL SCIENCES, Philadelphia, PA. For more information contact: Steven M. Gertz, Ph.D., R.F. Weston Inc., Weston Way, West Chester, PA 19380.

Oct. 12-13---NORTHEASTERN WISCONSIN CHEESEMAKERS' AND BUTTERMAKERS' ASSOCIATION ANNUAL MEETING, Cliff & Ceil's Hall, Green Bay. For more information contact: Clyde Andrews, sec., R. 3, Gillett, WI 54124.

Oct. 13-14---NEBRASKA DAIRY INDUSTRIES ASSOCIATION, 28th ANNUAL CONVENTION, Regency West Motel, Omaha, NE. For more information contact: T. A. Evans, Executive Secretary, 134 Filley Hall, East Campus, University of Nebraska, Lincoln, NE 68583.

Oct. 13---IOWA ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS FALL MEETING. Holiday Inn, Cedar Rapids, IA. For more information contact: Jack L. Schoop, 602 East 1st St., Des Moines, IA 50307.

Oct. 21-22---WHEY PRODUCTS CONFERENCE, The Hyatt Regency Woodfield, Schaumburg, IL. Whey Products Institute, 130 N. franklin St., Chicago, IL 60606; 312-782-5455.

Oct. 26---ILLINOIS ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS FALL MEETING. For more information contact: Clem J. Honer, 1 S 760 Kenilworth Ave., Glen Ellyn, IL 60137.

Oct. 27---11th ANNUAL EASTERN DAIRY-DELI ASSOCIATION NEW PRODUCTS TASTE SHOW, New York City Passenger Ship Terminal Pier, Hudson River, NY. EDDA, P.O. Box 35, Forest Hills, NY 11375.

Nov. 8-11---UCD/FDA BETTER PROCESS CONTROL SCHOOL. University of California. Contact: R. C. Pearl, Department of food Science & Technology, Univeristy of California, Davis, CA 95616.

Nov. 15-19---1982 PACK EXPO '82, Chicago's McCormick Place, Chicago, IL. For more information contact: Robert Newton, 212-586-8100.

**1983**

Jan. 10-13---EIGHTH ANNUAL TROPICAL AND SUBTROPICAL FISHERIES CONFERENCE OF THE AMERICAS. Agenda includes topics in seafood quality control, etc. Admiral Benbow Inn, Tampa, FL. Chairman, W. Steven Otwell, Dept. of Food Science & Human Nutrition, University of FL, Gainesville, FL 32611, 904-392-1991.

Jan. 30-Feb. 2---THIRD INTERNATIONAL SWEETENER COLLOQUIUM, The Pointe, Phoenix, AZ. For more information contact: Sugar Users Group, 910 Seventeenth St. NW, Suite 1105, Washington, DC 20006. Phone: 202-296-4250.

Feb. 10-13---ALIMAC '83, Bologna. For more information contact: Senaf, 40127 Bologna Via Michelino, 69.

Feb. 16-17---DAIRY AND FOOD INDUSTRY CONFERENCE, The Ohio State University. For information contact: John Lindamood, Department of Food Science and Nutrition, 2121 Fyffe Road, The Ohio State University, Columbus, OH 43210.

March 21-25---MID-WEST WORKSHOP IN MILK AND FOOD SANITATION, The Ohio State University. For information contact: John Lindamood, Department of food Science and Nutrition, 2121 Fyffe Road, The Ohio State University, Columbus, OH 43210.

March 23-24---IOWA ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS SPRING MEETING, Starlite Village, Ames, IA. For more information contact: Jack L. Schoop, 602 East 1st St., Des Moines, IA 50307.

April 11-13---DAIRY AND FOOD INDUSTRIES SUPPLY ASSOCIATION, 64th ANNUAL MEETING, Boca Raton Hotel and Club, Baco Raton, FL. For more information: Dairy and Food Industries Supply Association, 6245 Executive Blvd., Rockville, MD 20852, 301-984-1444.

April 20-22---SOUTH DAKOTA ENVIRONMENTAL HEALTH ASSOC. ANNUAL MEETING. Howard Johnsons, Sioux Falls, SD. For more information contact: Morris V. Forstine, SD State Dept. Health, 1320 S. Minnesota Ave., Room 101, Sioux Falls, SD 57105.

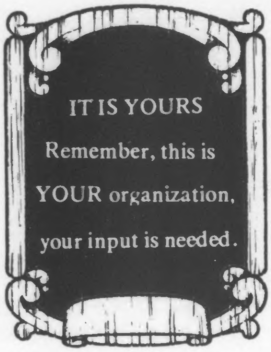
April 26---ILLINOIS ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS SPRING MEETING. For more information contact: Clem J. Honer, 1 S 760 Kenilworth Ave., Glen Ellyn, IL 60137.

August 7-11, 1983---IAMFES ANNUAL MEETING, St. Louis, MO.

Sept. 7-9---SYMPOSIUM ONLACTIC 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. 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.

# 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.

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One trouble with the world today is that there are too many people in it who are willing to put in their oars - but not willing to row.

Hugh Allen - Knoxville News-Sentinel

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**IFT '82 WINNERS...**

IAMFES, Inc. exhibited at the IFT '82 Food Technology Show in Las Vegas the end of June. Attendees were able to register to win either the 1981 volume of *Dairy and Food Sanitation* or the *Journal of Food Protection*.

The winners from the drawing were: M. Brodnitz, New York (winner of the 1981 volume of the *Journal of Food Protection*) and Roger Law, Oregon (winner of the 1981 volume of *Dairy and Food Sanitation*).

Congratulations!

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**Pennsylvanians Hear About Protein Payments and the Impact of Antiobitcs**

More than 270 persons participated in the Dairy Sanitarian's - Laboratory Director's Conference held May 24-26, 1982 at The Pennsylvania State University. Presentations and panels included more than 45 persons who covered a wide variety of topics.

Participant evaluation ratings indicated that two of the topics of greatest value were a proposed plan to pay for milk based on protein content and a farmer-fieldman-processor panel giving the impact of actual antibiotic problems. Other topics included causes of milkfat test variations, water testing, roles of fieldmen, controlling milk losses, and the future of imitations. The last two half days were split into separate sessions for sanitarians and laboratory directors. Examples of topics were low temperature cleaning, correcting problems of water supplies, training plant employees, inspecting and correcting plant problems, the economic outlook and energy saving devices.

Frank Balliet, Manager of Farm Quality for Dairylea Cooperative, was given the Sanitarians Award. Dr. Charles W. Livak, retired Director of Quality Assurance for Penn Dairies, received the Distinguished Service Award.

Planning committees meet in late September to initiate action for the 1983 program to be held May 23-25 at Penn State.

-Sidney E. Barnard

**I AMFES NEWS BULLETIN**

Those who attended the A.E.C. 1982 meeting had a delightful time and a wonderful program highlighted by the presentation of the first FAMFES scholarship at University of Florida to Ms. Caryn Funkhouser. For those who did not attend, Caryn lives in Gainesville, plans to graduate in the spring of 1983, has won many other honors at the University community, has maintained a 3.4 average out of a possible 4.0, plans a career in Food Science, and is very active in University and community activities. She impressed us as a very worthy recipient and is most appreciative. A letter of appreciation has also been received from Dr. James R. Kirk, Professor and Chairman of the Food Science and Human Nutrition Department.

Following the banquet Dr. Howard Appeldorf delivered a powerful and colorful message on "Nutrition For The New Generation". It took hours for the enthusiasm and thrill of the evening to die down. Debby Miller and Dr. James Jezeski put together a great program which did not tone down until it finally unwound at the curtain fall at 12:00 noon on Thursday, April 15, 1982.

The University staff of Food Science and Human Nutrition were most cooperative and very cordial in their relationship with us and certainly went the extra mile to make us feel welcome during our stay there. Dr. Jezeski, Dr. Ken Smith, and Dr. Koburger were most helpful and extended every courtesy possible to make the program a success. Doris Marchetti and all board members worked diligently and were very alert and responsive to the needs of the program and membership. Many others like Mrs. Ruth Roche, Executive Secretary of T. G. Lee, did program typing and were very helpful in making the program beneficial and enjoyable to all. To all of you, too numerous to mention, we thank you, appreciate you, and cannot say enough. All speakers have been given letters of aprpeciation we hope and if we missed you the "slip-up" was unintentional. Please forgive us.

## Newsletter continued. . .

### TENNESSEE ASSOCIATION OF MILK, WATER, & FOOD PROTECTION HOLDS 3RD ANNUAL MEETING

The Third Annual Meeting of our Tennessee Association was held at the Ramada Inn-Airport in Nashville on June 22-23, 1982 with 65 people taking part. The people in attendance and their interest and participation did much to assure the success of this meeting.

Don Spencer, President of the Tennessee Affiliate, called the meeting to order at 12:30 and gave the official call. Robert Reeves, Director of Food & Dairy Division, T.D.A., gave a very warm welcome to our group and was very complimentary concerning the favorable growth that we have experienced in the last three years.

C. E. White gave a brief report concerning the annual meeting of the International Association and encouraged as many as possible to attend the Louisville, Ky. meeting that will be held on August 22-26. We trust that many of our Tennessee members can attend since the annual meeting will be this close to home. During the report, a review of International membership by states was given and it was encouraging to note that Tennessee ranked third in the Southern states and 13th in the International. We trust that other members will recognize the importance and affiliate with the International.

This was the first year that our Tenn. Association has attempted to have specific talks on the three disciplines of water, food and milk. Emily McKnight, our President Elect, served as Session Chairman for the Water and Food topics. Under the Water Session, Lester Barnett with the TN Dept. of Health, gave a very informative discussion concerning the "Water Supplies - Are They Safe". During Mr. Barnetts discussion many topics were covered concerning the selection of proper water sources and the proper construction needed to assure a safe supply for human consumption.

Ruth Fuqua with Dairymen, gave a most informative presentation on the relationship of farm water supplies and milk quality. The 1978 PMO and the IMS requirements confirmed the very direct relationship that exists between water supplies and milk quality. It was pointed out that water supplies change from year to year and a real need exists to make sure that supplies are maintained safe and potable for use around the dairy operations. She pointed out that there is a very direct relationship between psychrotrophic bacteria and in the shelf life of finished products. She presented many excellent examples that diary farmers and sanitarians need to follow in order to maintain proper water supplies.

Carroll Sellers, Senior Food Specialist with Food & Drug Ad. gave an excellent presentation on the Cooperative State-FDA Food Sanitation Program. Mr. Sellers explained that more than 8 million people work in food retail establishments and serve more than 75 million meals per day. Retail food sales is the fourth largest business in the United States. The Food & Drug Administration has prepared a recommended ordinance for local state adoption which is Food Service Sanitation Mangement. Mr. Sellers pointed out that the overall job in food sanitation was most difficult from a public health standpoint and was a very challenging job.

Frank Duncan, with the Knox County Health Dept., presented a very timely discussion concerning "Food Sanitation Services - World's Fair. Mr. Duncan is responsible for the inspection services of the Knox County Health Dept. and he reviewed the planning and the implementation of these plans that have been necessary to assure the public health aspect of all food facilities at the 1982 World's Fair. It was most interesting to hear the details of the work that has gone into this project and to learn that the expected attendance at the Fair has been almost doubled than was anticipated. His presentation certainly stimulated interest in attending the Fair.

Carl Moore, with A.M.P.I., Martin, Tennessee, served as Session Chairman for two very informative talks and first of these was by Bob Kosman. Mr. Kosman is General Manger of the Heritage Farms Dairy plant in Murfreesboro, Tennessee which provides milk and milk products for all Kroger stores in six Southern states. Energy conservation that has been included in the planning and operation of the new Kroger plant was the subject covered and this was done in a very informative manner through comments and a slide presentation. An indication to the overall interest that was stimulated by Mr. Kosman was approximately half of our people. This facility was most impressive and we are deeply indebted to Heritage Farms for their invitation and hospitality.

Ted Hickerson, Quality Control Supervisor for A.M.P.I., Arlington, Texas, gave a very thorough review on the subject of "Raw Milk Quality - What to Look For". Mr. Hickerson stressed the importance of a good educational program that covered farmers, milk haulers, milk processors, milk distributors, milk retailers, and the final consumers. Many other aspects of their raw milk quality program was covered by the speaker and this proved to be a very worthwhile session.

The evening activities covered a very enjoyable social hour followed by our annual banquet. Herb Holt, University of Tenn., served as Master of Ceremonies, and Murray Miles, with the tennessee Farm Bureau, Columbia, Tenn., gave a most inspiring talk on the subject "They Ought to Fix It". Following the humorous introduction, Mr. Miles gave all of us some very challenging thoughts that would enable each of us to do our jobs more successfully. We were very pleased to have a number of the members wives in attendance at this banquet.

On Wednesday morning, our session was chaired by Danny Morgan, Plant Manager, Flav-O-Rich, Nashville. The first speaker on this phase of our program was Joe Huseman who is Quality Control supervisor for Dairymen, Bristol, Va. Mr. Huseman, through a series of slides and commentary, gave all of those in attendance a real thorough review of the roll that P.I. counts can play in improving milk quality. A Klenzaid film was used to cover all aspects of

## Newsletter continued. . .

good management practices that will reduce P.I. counts and assure extended shelf life of finished products. We were privileged at our annual meeting to hear a very excellent presentation on UHT milk by Mrs. Ruth Fuqua of Dairymen. This new product from their Savannah, Ga. plant is now on display and being served at the 1982 World's Fair in Knoxville. Mrs. Fuqua had a half-pint sample of the Farm-Best 2% Lowfat milk (UHT) for each person in attendance. After showing a slide presentation on this new product and processing, those in attendance had an opportunity to personally sample this new products. Comments were very favorable towards the taste and flavor of this new UHT milk.

Dr. David Hunter, Agricultural Economist with the University of Tenn., did an excellent job in bringing the group up to date as to the present dairy situation and outlook. As pointed out by Dr.Hunter, the industry is facing a real challenge from over-production problems but as pointed out by Dr. Hunter, the decline in milk consumption has been a very detrimental factor in our overall demand and supply picture. If consumers today were consuming milk at the same level as they were in 1950, there would be shortage of milk instead of surplus. A thorough review of the proposed 1981 Farm Bill as it affected milking was given by Dr. Hunter and the entire group was brought up to date concerning the dairy outlook.

Following a very enjoyable milk and ice cream break, Ray Rottero, Quality Control Supervisor for Purity Dairy, Nashville, conducted our final session. The first time, the topic "Imitation Milk Products" was covered by Mrs. Pat Wallin with the Dairy Council of the S.E., Knoxville, TN. It was felt by the Program Planning Committee that the subject of "Imitation" should be addressed and the best way to do this was from a nutritional standpoint. Mrs. Wallin, in her presentation, gave a very good comparison of the nutritional value of milk and imitation products. Our entire group was very pleased with this presentation.

Harold Rose, Executive Secretary, Tennessee Dairy Products, Nashville, informed the group of the activities of his Association. Basically, the Tenn. Dairy Products Ass'n. serves as a coordinating program for the many matters facing the 16 Grade A plants, 12 manufacturing plants, 11 ice cream plants, and the more than 4,000 employees in these plants. These activities cover legislative, educational, and current problems facing the dairy industry in Tennessee.

To show that the dairy industry has a very positive program underway to sell milk and milk products, Bob Basse of the American Dairy Ass'n, presented the "Real Seal" program. Mr. Basse's presentation, together with "Real Seal Programs" did much to reassure all of us in the dairy industry that we have a real opportunity to sell our products and at the same time to sell a very highly nutritious product.

During the election of the officers, Carl Moore, A.M.P.I., Martin, Tn., was elected Vice President for 1983. Herb Holt will become the new President; Emily McKnight, President Elect; Ruth Fuqua, Archivist; and Cecil E. White, Secretary-Treasurer.

During the business session, Ruth Fuqua discussed the interest of the International Association to consider holding our 1985 International Annual Meeting in Nashville. After much discussion, Ken Whaley moved that the President have the Executive Board study the possibility of hosting the 1985 meeting and to make a presentation to the International. The motion was seconded by Dr. Demott; the motion passed. Following our meeting, the Executive Board met with some members to further consider this situation. It was suggested that initial contacts be made to possible hotel-motel facilities as to rates and accommodations and following this information, the group would again meet to further study the findings in July.

It was moved by Harold Rutherford and seconded by Mike Long that our Tennessee Affiliate again hold a workshop in Knoxville and Nashville this fall or winter. The subject of this workshop would be determined at a future meeting of the Executive Board.

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# JFP Abstracts

*Abstracts of papers in the September* Journal of Food Protection
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**Behavior of *Staphylococcus aureus* in Cheddar Cheese Made with Sodium Chloride or a Mixture of Sodium Chloride and Potassium Chloride,** Susan Koenig and Elmer H. Marth*, Department of Food Science and The Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

*J. Food Prot.* 45:996-1002

Stirred-curd Cheddar cheese was manufactured from milk artificially contaminated with <1000 *Staphylococcus aureus* cells/ml. Lactic starter culture was added to the milk at the rate of 1.0 or 0.5% (v/v). Curds were divided and salted with either NaCl or a mixture of KCl/NaCl to achieve final salt concentrations of approximately 2.4 or 1.2%. Some portions of curd remained unsalted. Cheeses were analyzed for moisture and salt content and were stored at 4 or 10°C for 8 weeks. Bacterial counts and pH values were determined during manufacture and storage of cheeses. Unsalted cheeses had the lowest and the 2.4%-salted cheese had the highest *S. aureus* counts. Cheeses salted with KCl/NaCl had considerably lower *S. aureus* and non-*S. aureus* counts than did cheeses salted with NaCl. All cheeses made with 1.0% starter culture had appreciably lower counts of *S. aureus* than did cheeses made with 0.5% starter culture. Low levels (0.05 to 0.52 ng/g) of enterotoxin A were found in 16 of 17 samples tested with the radio immunoassay procedure. Presence of enterotoxin was not directly associated with the kind or amount of salt used to produce the cheese.

**Fate of *Escherichia coli* and *Salmonella typhimurium* in a Food Film on Stainless Steel at 5°C[1],** R. L. Dyer and R. B. Maxcy*, Department of Food Science and Technology, University of Nebraska, Lincoln, Nebraska 68583

*J. Food Prot.* 45:1003-1006

The fate of *Escherichia coli* and *Salmonella typhimurium* in a model system of food residue was determined. Bacteria were grown at 32°C in plate count broth or beef "serum", placed on stainless steel, then dried at 5°C under quiescent or forced air and held for 24 h. Survival was determined by enumeration on plate count agar, and injury was determined by failure of *E. coli* to grow on violet red bile agar or *S. typhimurium* to grow on brilliant green agar. The physiological age of a culture was a major determinant of survival and injury. At the most vulnerable age of bacteria in plate count broth, approximately 99.9% of the cells died during the test period and 90% of the survivors was injured. In beef serum there was less death and injury than in plate count broth. The forced air environment was less destructive than the quiescent environment. The model system indicated bacteria in a food film may be in an unfavorable environment, and the surviving bacteria may not be enumerated with commonly used selective media.

**Inhibition of *Bacillus cereus* by Garlic Extracts,** Zahira M. Saleem and Khalafs S. Al-Delaimy*, Department of Food Science, College of Agriculture, University of Baghdad, Abu-Ghraib, Iraq

*J. Food Prot.* 45:1007-1009

Aqueous extract of garlic (*Allium sativum*, L.) was prepared from a 1:2 (wt/vol) ratio of fresh garlic bulbs to sterilize distilled water. Garlic extracts of 3%, 5% and 10% inhibited the growth of *Bacillus cereus* on nutrient agar plates 31.3%, 58.2% and 100%, respectively. Extracts from garlic bulbs stored at -18°C are slightly more inhibitory to the growth of *B. cereus* than extracts from bulbs stored at 15-35°C for 6 months. The greatest extract activity was found when garlic bulbs were extracted and left at 30°C for 4 h before filtration. When the macerate was held at 4°C, 6 h of storage were needed for the extract to reach its greatest activity. Gamma irradiation, at the dose of 570 krads, of garlic bulbs with subsequent freezing before extraction decreased the extracts original activity up to 50%. Exposing the extracts to heat treatments of 80-90°C for a total heating time of 5 min completely destroyed the antibacterial activity of the extract.

**Efficient Cleaning with Warm Water,** R. L. Bradley, Jr., Department of Food Science, University of Wisconsin-Madison, Madison, Wisconsin

*J. Food Prot.* 45:1010-1012

A prototype chlorinated alkaline cleaner (Diversey-Wyandotte PX 1704) functioned satisfactorily in recirculating water with temperatures as low as 30°C (85°F), whereas typical cleaner formulations currently in use require that water be at least at 60°C (140°F). On-farm experiments for periods up to 1 year with both hard (342 ppm) and softened water gave results similar to those of control periods before water temperature reduction. At each milk delivery to the University of Wisconsin Dairy, collected samples were evaluated for Standard Plate Count and for coliform and psychrotroph populations. Routine inspections with partial disassembly of the equipment showed no evidence of insanitary conditions, accumulation of deposits or conditions which would cause bacteria counts to increase. Evidence shows the importance of this cleaner in that dairy farmers can reduce use of hot water and thus markedly reduce expenditures for energy without sacrificing product quality.

**Microbial Counts on Surfaces of Lamb Carcasses and Shelf-Life of Refrigerated Ground Lamb,** Sajida H. Ali, D. F. Hoshyare and K. S. Al-Delaimy*, Department of Food Science, College of Agriculture, University of Baghdad, Abu-Ghraib, Iraq

*J. Food Prot.* 45:1013-1015

Aerobic plate counts (APC) and counts on psychrotrophs, coliforms, *Staphylococcus aureus* and molds plus yeasts were made from the surface of fresh lamb carcasses and in ground lamb during refrigerated storage in Baghdad, Iraq. The average surface counts of carcasses sampled weekly over a 16-wk period were $1.1 \times 10^6/cm^2$ and $2.6 \times 10^4/cm^2$ for APC and psychrotrophs, respectively. The average ground lamb counts sampled weekly over a 5-wk period were $3.1 \times 10^5/g$ and $1.2 \times 10^5/g$ for APC and psychrotrophs, respectively. The average coliform, *S. aureus* and yeast plus mold counts were all between $10^3$ and $10^4$ CFU per $cm^2$ or g for carcasses and ground lamb, respectively, on the day of slaughtering. Upon storage of the ground lamb at 2, 4, 5 and 6°C, both APC and psychrotroph counts increased to $10^9$ CFU/g within 1 wk with more rapid microbial growth as the storage temperature increased from 2 to 6°C. Organoleptic spoilage was first detected when APC reached $10^9$ CFU/g, or about 6 d at 5 to 6°C. The fat content of the ground lamb did not appreciably affect the APC and psychrotroph counts. Of 50 isolates of *S. aureus*, 48 were coagulase-positive.

**Evaluation of Three Carcass Surface Microbial Sampling Techniques,** G. L. Nortje*, Elsa Swanepoel, R. T. Naude, W. H. Holzapfel[i] nd P. L. Steyn, Animal and Dairy Science Research Inst tute, Pr vate Bag X2, Irene 1675, South Afr ca

*J. Food Prot.* 45:1016-1017

Three carcass surface microbial sampling techniques were evaluated: a double swab, an excision and an agar sausage technique. In each instance, a sampling area of 6,42 $cm^2$ was used. For the double swab technique, two sterile dry swabs were used. A sterile meat borer was used to cut out the area of 6,42 $cm^2$ for the excision technique. For the agar sausage technique, 50-$cm^3$ medical syringes were used to take impression plate samples. All the samples obtained with the different techniques were subjected to serial dilutions, whereafter they were spread-plated in duplicate on prepoured plates. Results of the study indicated that there was a significant difference ($P<0,05$) between the three techniques. The excision technique was the most reliable while the agar sausage technique had a higher coefficient of determination ($r^2$ value) with the excision technique than did the swab technique.

**Survival of *Campylobacter fetus* subsp. *jejuni* in Cheddar and Cottage Cheese,** J. G. Ehlers, M. Chapparo-Serrano, R. L. Richter and C. Vanderzant*, Department of Animal Science, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas 77843

*J. Food Prot.* 45:1018-1021

*Campylobacter fetus* subsp. *jejuni* inoculated into Cheddar cheese milk at concentrations ranging from $10^2$-$10^6$ cells per ml was not detectable in the curd after 30-60 d of curing. When milk for cottage cheese manufacture was inoculated with $10^5$-$10^6$ cells of *C. fetus* subsp. *jejuni*, the organism was not detectable in the whey or curd after cooking for 30 min at 55°C.

**Compensating for Temperature Drops in Still Retorts,** William H. Stroup, Department of Health and Human Services, Food and Drug Administration, Bureau of Foods, Division of Food Technology, Food Engineering Branch, Cincinnati, Ohio 45226

*J. Food Prot.* 45:1022-1027

Heat penetration measurements were done on $303 \times 406$ and $603 \times 700$ cans of whole kernel corn in brine in a still retort with intentional deviations in retort temperature. Based on the magnitude and duration of the deviation, supplemental time at the scheduled process temperature was added to the process according to published correction procedures. In all cases (six points from the correction procedure were evaluated), the least $F_o$ values for the corrected processes were equal to or greater than the least $F_o$ values for the corresponding scheduled process without deviation. On $303 \times 406$ cans with a retort temperature of 121.1°C, the least $F_o$ values for the corrected processes ranged from 15.1 to 18.8, compared with 14.7 for the 26-L process. On $303 \times 406$ cans with a retort temperature of 115.6°C, the least $F_o$ values for the corrected processes ranged from 10.9 to 12.3, compared with 10.8 for the 26-L process. Accordingly, the published correction procedures were satisfactory to compensate for temperature drops in still retorts for the convention heating product used in this study.

***Clostridium botulinum* Spores in Infant Foods: A Survey,** Donald A. Kautter*, Timothy Lilly, Jr., Haim M. Solomon, and Richard K. Lynt, Division of Microbiology, Food and Drug Administration, Waashington, D.C. 20204

*J. Food Prot.* 45:1028-1029

In an examination of 10 categories of infant foods obtained in the Washington, D.C. area, *Clostridium botulinum* spores were detected in 2 of 100 samples of honey and 8 of 40 samples of corn syrup. This is the first report of the occurrence of *C. botulinum* spores in retail samples of corn syrup. In an ensuing nationwide survey of corn syrup, *C. botulinum* spores were detected in 5 of 961 bottles examined.

**Comparison of Physiological Parameters Useful for Assessment of Activity of Antifungal Agents in Feed and Ingredients,** Zhanet Tabib, Winston M. Hagler and Pat B. Hamilton*, Department of Poultry Science and Department of Microbiology, North Carolina State University, Raleigh, North Carolina 27650

*J. Food Prot.* 45:1030-1037

Propionic acid at all levels tried (0.125, 0.25, 0.5, 1.0 and 2.0 mg/g of substrate) decreased the total mold count of poultry feed of 15 or 20% $H_2O$ content, but increased the count at 25 or 30% $H_2O$ content. The paradoxical effect which was time-dependent could be explained on the basis that the total mold count reflected the status of spores rather than the total fungal activity. Assessments of antifungal activity based on respiratory activity, such as weight loss of substrate, heat production and changes in $CO_2$, $O_2$, and $H_2O$ content of feed but not pH, did not display such paradoxical behavior. Measurement of $CO_2$ production from feed and ingredients for assessment of antifungal agents was preferred for its ease, speed, economy, accuracy and precision. The findings that most of the $CO_2$ was produced aerobically (assuming a respiratory quotient of 1.0), that yeasts, bacteria, and some fungi produced some $CO_2$ anaerobically, that selective inhibitors of isolates from corn meal could not differentiate the production of $CO_2$ from corn meal by bacteria, yeast and fungi, that all three types of microorganisms were active at water concentrations likely to occur in stored feed and ingredients, and that differential plate counts revealed increases in all three classes suggested that all three classes are involved in deterioration of feed ingredients. Consequently, antifungal agents used in feed and ingredients need broad antimicrobial activity and the methods for the assessment of antifungal agents should detect this broad spectrum of activity.

**Antimicrobial Activity of Butylated Hydroxyanisole and Potassium Sorbate Against Natural Microflora in Raw Turkey Meat and *Salmonella typhimurium* in Cooked Turkey Meat,** M. M. Morad, A. L. Branen and C. J. Brekke*, Department of Food Science and Technology, Washington State University, Pullman, Washington 99164-6330

*J. Food Prot.* 45:1038-1040

The antimicrobial activity of butylated hydroxyanisole (BHA) (100 ppm) and potassium sorbate (1000 ppm), individually and in combination, was evaluated against growth of the natural microbial flora in raw turkey meat and against *Salmonella typhimurium* inoculated into cooked turkey meat. Growth of the natural flora was not inhibited by using either BHA or sorbate alone; however, slight inhibition was shown using a combination of the two. BHA, sorbate and a combination were effective to the same extent in preventing growth of naturally present gram-negative organisms. Sorbate and the BHA-sorbate combination did not differ in their effectiveness and were more effective than BHA alone in reducing numbers of *S. typhimurium* in cooked turkey.

**Survival of Fecal Coliforms in Frozen Vegetable Homogenates,** D. F. Splittstoesser*, J. D. Stewart and M. Wilkison, Institute of Food Science, Cornell University, New York State Agricultural Experiment Station, Geneva, New York 14456

*J. Food Prot.* 45:1041-1043

The resistance to freezing of fecal coliforms isolated from frozen vegetables was compared to that of *Escherichia coli* isolated from fecal sources. The objective was to see if lower resistance to freezing might explain frozen vegetable samples that contain fecal coliforms but not *E. coli*. Survivals after 200 d at -10°C in vegetable homogenates ranged from 0.014 to 75% for resuscitated vegetable isolates compared to 0.49 to 18% for resuscitated *E. coli* isolated from fecal sources. Resuscitation 1 h on Trypticase Soy Agar followed by an overlay with Violet Red Bile Agar (VRBA) increased recoveries about 11-fold over that obtained when the cultures were plated directly on VRBA. Mixed vegetable homogenates permitted higher survivals than homogenates prepared from snap beans, broccoli or mustard greens.

**Challenge of Pasteurized Process Cheese Spreads with *Clostridium botulinum* Using In-Process and Post-Process Inoculation,** Nobumasa Tanaka, Food Research Institute, Department of Food Microbiology and Toxicology, University of Wisconsin, Madison, Wisconsin 53706

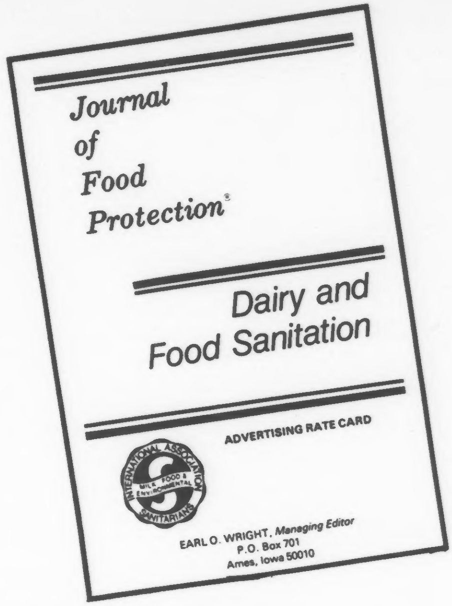
*J. Food Prot.* 45:1044-1050

A study was done to evaluate the antibotulinal safety of pasteurized process cheese spreads and to compare two different published methods of inoculation of cheese spreads with *Clostridium botulinum* spores. Pasteurized process cheese spreads of various compositions were challenged with approximately 1,000 spores per g of *C. botulinum* types A and B. Two different methods of challenge were tested: (a) an "in-process" or "hot" inoculation in which a spore suspension was added to hot cheese spread in a cooker during agitation, and (b) a "post-process" or "cold" inoculation in which 0.1 ml of heat-shocked (80°C, 10 min) spore suspension was added to cheese spread already packed in glass jars and stirred. Certain products that were thought to have an adequate margin of safety by hot challenge studies became toxic when challenged by the cold method. Experiments to check localization of the spores in cold-inoculated cheese spread produced results suggesting that the concentration of the inoculum plus the localized diluting effect of added water in the cold-inoculated cheese spread probably account for the discrepancy between the two procedures.

**Foodborne Illness Caused by *Escherichia coli:* A Review,** Jeffrey L. Kornacki and Elmer H. Marth*, Department of Food Science and The Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

*J. Food Prot.* 45:1051-1067

Enteropathogenic *Escherichia coli* (EEC) can be defined as any strain of *E. coli* that has the potential to cause diarrheal illness. Four major categories of EEC exist. Classical enteropathogenic *E. coli* (EPEC) commonly refers to serogroups of *E. coli* historically associated with outbreaks of diarrhea in young children and infants. Facultatively enteropathogenic *E. coli* (FEEC) are non-EPEC serogroups associated with sporadic diarrhea, and include many serogroups associated with the normal intestinal flora. Enterotoxigenic *E. coli* (ETEC) is commonly isolated from outbreaks of traveler's diarrhea, and includes those strains which produce a heat-stable enterotoxin (ST) only, a heat-labile enterotoxin (LT) only and those which produce both ST and LT. These organisms adhere to and colonize the epithelial cell surfaces of the proximal small intestine. This colonization is mediated by specific types of fimbriae which are host-specific. Toxigenicity is plasmid-related. Enteroinvasive *E. coli* (EIEC) exert their pathogenic effect through an invasive infection of the gastrointestinal tract. Many techniques currently exist to determine the presence of enterotoxins produced by a particular strain of *E. coli*. These include bioassay, tissue culture and in vitro immunological techniques. Of the newer in vitro immunological methods, the staphylococcal coagglutination technique to detect LT seems to have potential for routine use in diagnostic microbiology laboratories. Since large numbers ($10^6$ - $10^9$) of EEC are necessary for diarrhea, an unsanitary environment is needed for transmission of illness. Presence of EEC varies geographically; however, *E. coli* diarrhea is not likely to occur in the more hygenic areas of the world, except in occasional common-source outbreaks where the organism has time to replicate in food or water. The following foods have been implicated in documented *E. coli* diarrheal outbreaks worldwide: meat and meat products, fish, poultry, milk and dairy products, vegetables, baked products, rice formulations, coffee substitutes and water.

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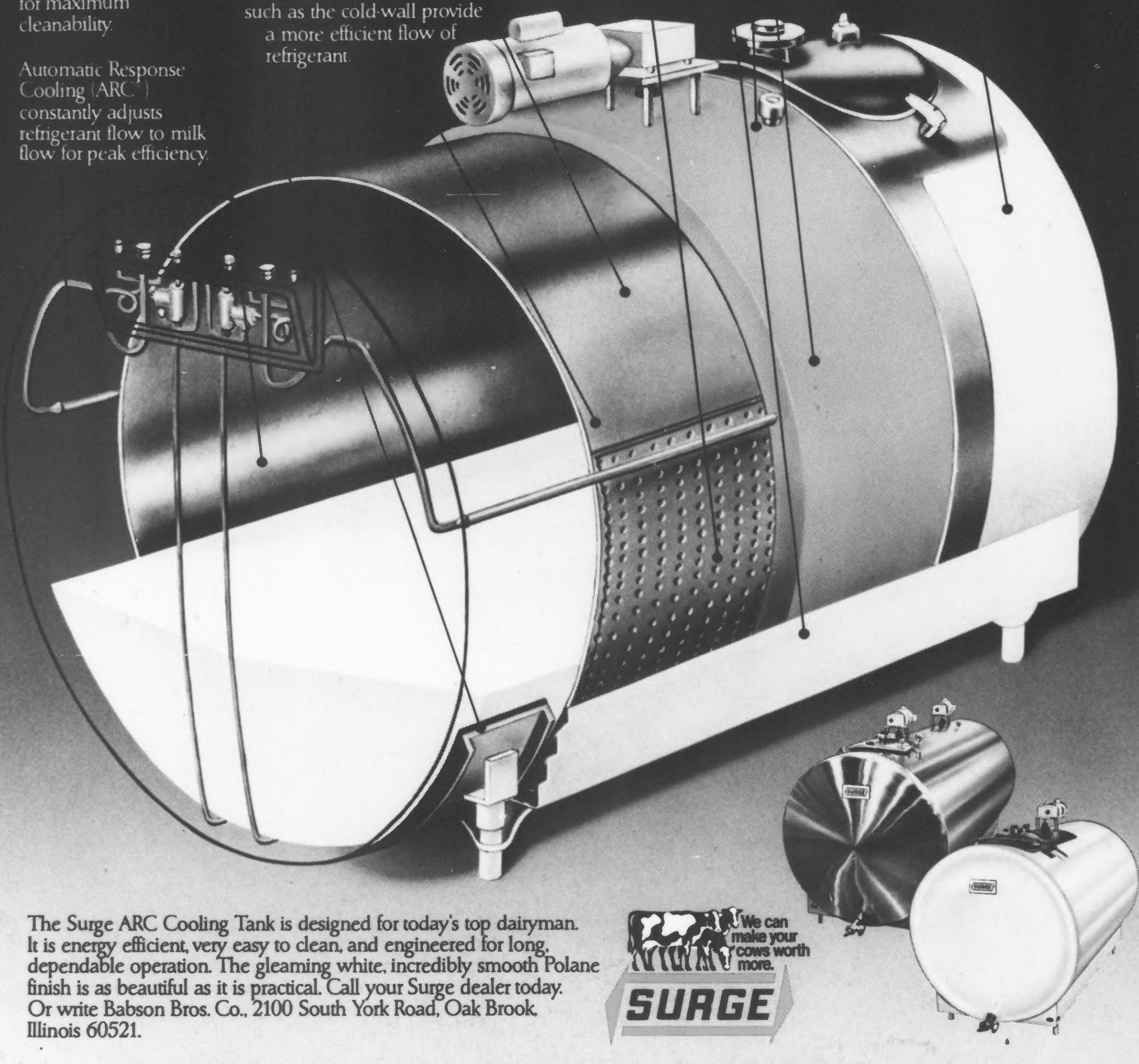


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