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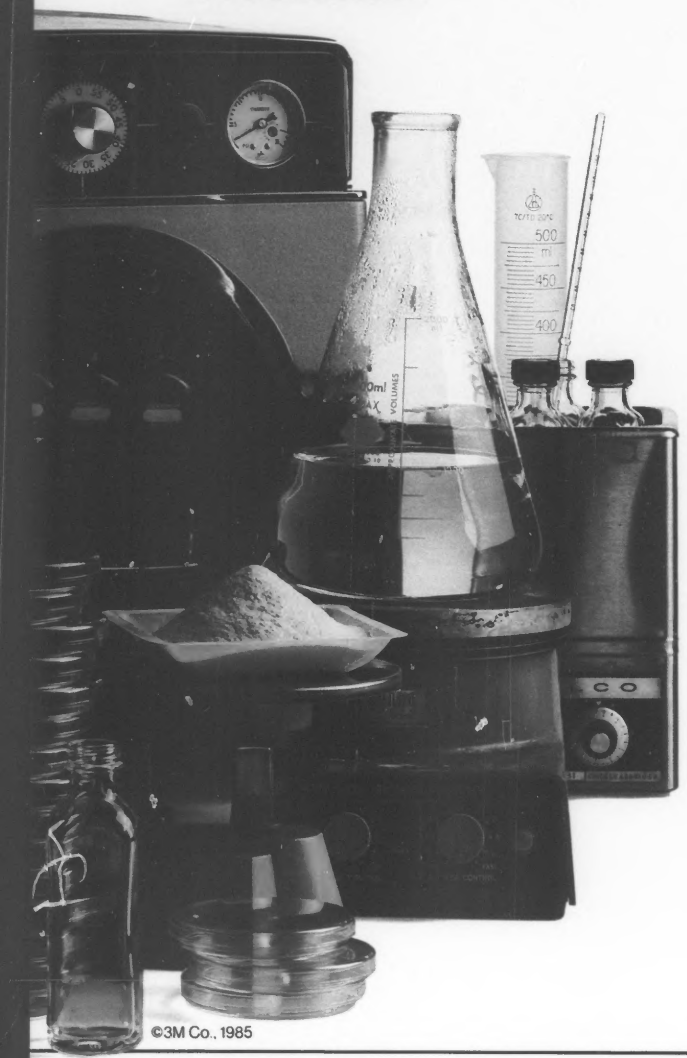

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THE SCHOOL FOOD SERVICE OPERATION: AN ANALYSIS OF HEALTH HAZARDS

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An analysis of public health hazards was conducted in a school food service operation. Observations were concentrated on foods and ingredients and on the following phases related to foods, personnel and equipment: storage, preparation, holding, distribution, serving, cleaning, and sanitation. The public health aspects of each phase are discussed. A critical control point system was suggested on the basis of the field observations and analysis.

INTRODUCTION

The food service industry, including schools, serves a variety of dishes and types of meals. As the number of dishes and meals that are eaten away from home increases, the problem of prevention of food-borne diseases grows more complex. There have been enough indications of unsanitary food handling and time-temperature abuse from reported studies and inspections of school food service operations. Some food service workers lack complete knowledge of food service sanitation and technology specifications and often do not understand the reasons behind them (1). According to the CDC (11), twelve outbreaks of food-borne disease were recorded nationwide in schools during 1979. Eleven outbreaks out of the twelve were due to bacterial agents (*Staphylococcus aureus*, 6; *Salmonella, Escherichia cloacae*, and *Clostridium perfringens*, 2 each). In Arizona, 21 cases of *C. perfringens* poisoning in 1979 were associated with beef served at school (11). A similar observation, in the United Kingdom, of two outbreaks of *C. perfringens* food poisoning one year apart in the same school canteen was reported by Hobbs (28). The two outbreaks were associated with cooked meat left unrefrigerated. The major responsibility of the food service industry is to provide safe and wholesome food to the consumer. A specific food service system which commands special attention is the school food service operation. Many school systems in the United States currently use a centrally located kitchen with different packaging for transportation to and service at satellite schools. Some common school lunch delivery systems are: 1) transportation of food in bulk and food is portioned at the satellite schools; 2) food is portioned at the central preparation site and transported, hot or cold, to the satellite schools; and 3) purchase of either frozen preportioned or canned meal items which are heated to serving temperature in individual schools (56). The control of microbial contamination of food, and the control of microbial proliferation and toxin production in the food are common to the school food service system, regardless of the method of distribution. Proper control of potential food hazards can be obtained through the use of the Hazard Analysis Critical Control Point (HACCP) concept. The HACCP concept is a preventive system of control, particularly with regard to microbiological hazards (6). Hazard analysis includes the identification of potentially hazardous foods and sensitive ingredients that may contain poisonous substances, pathogens and/or that can support microbial growth. It also identifies sources and specific points of contamination, critical food preparation procedures, food holding conditions, and relevant human practices as they affect product safety. The critical points are those preparation/holding and transportation determiners whose loss of control would result in an unacceptable hazard (9). The purpose of this study was to conduct an analysis of public health hazards in a school food service operation and to suggest a critical control point system to assure the safety of foods.

PROCEDURES FOR THE ANALYSIS OF PUBLIC HEALTH HAZARDS

Five visits to a school food service central kitchen and cafeterias were used to examine the operation. The present operation prepares and serves 2000 meals/day in 6 locations. This food service operation was similar to the commissary food systems previously described (53). Discussions were conducted with the manager of the operation and with some food handlers. Observations were made during routine operation on the following: food and ingredients, storage of raw and ready-to-eat items, food preparation, holding and transportation of foods to satellite schools, food serving, cleaning, and sanitary practices. Each phase of the operation was studied and analyzed. The observations were used to establish critical control points in order to assure the safety of foods and prevent food-borne diseases. This study will report first the observations and then the analysis of public health hazards.

OBSERVATIONS AND ANALYSIS OF PUBLIC HEALTH HAZARDS

FOOD AND INGREDIENTS

Foods are provided to the present school food service operation by the United States Department of Agriculture (USDA). The foods/ingredients are supplied frozen, refrigerated, canned, or dry. Some commodities, such as lettuce and bananas, were delivered in insulated trucks. The frozen food items included ground beef, chicken drums and patties, whole turkey and turkey roasts, french fries, tater rounds, and Mozzarella. The refrigerated products were American and Cheddar cheese, and skim milk. The canned and bottled commodities included beef, green beans, mixed fruits, pears, peaches, roasted peanuts, honey, shortening, and salad oil. The dry foods were corn meal, flour, macaroni, and pinto beans.

Food products are classified in a variety of ways. Frazier and Westhoff (20) placed foods in three groups on the basis of ease of spoilage: 1) nonperishables, such as flour and dry beans which do not spoil unless handled carelessly; 2) semiperishables, such as potatoes and nut meats which, if properly handled and stored, will remain unspoiled for a long period; and 3) perishable foods, such as meats, poultry, fish, fruits, vegetables, eggs, and milk. These food items spoil readily unless preservation methods are used.

From the food safety and disease prevention point of view, some foods are considered "potentially hazardous." This consideration is based on the ability of certain foods to support multiplication of food-borne disease microorganisms. The Food and Drug Administration (FDA) Food Service Sanitation Manual (18) defined "potentially hazardous" foods as: any perishable food which consists in whole or in part of milk or milk products, eggs, meat, poultry, fish and shellfish, or other ingredients capable of supporting rapid and progressive growth of infectious or toxigenic microorganisms. The FDA named first, and considered the greatest danger to consumers, the food-borne toxigenic and pathogenic microorganisms (19). Among the food products obtained by the school food service central kitchen under consideration, one can identify "potentially hazardous" items such as ground beef, chicken and turkey products, milk, and cheeses. These food items were obtained either frozen or refrigerated. The FDA Food Service Sanitation Manual (18) specified requirements for milk, eggs, and shellfish because they are favorable media for the multiplication of food-borne disease microorganisms. For example, fluid milk and fluid milk products must be pasteurized and must meet the grade A quality standards as established by law. As far as eggs are concerned, only clean whole eggs with shell intact and without cracks or checks (or pasteurized liquid, frozen or dry eggs, or pasteurized dry egg products) shall be used, except that hard-boiled, peeled eggs commercially prepared and packaged may be used. Dirty eggs may have a higher contamination with *Salmonella*, while cracked and broken eggs may have had the egg white and yolk contaminated with *Salmonella*. The pasteurization of milk (15 sec at 72°C) and of whole liquid eggs (at least 3.5 min at 60°C) destroys food-borne toxigenic and infectious microorganisms including *Staphylococcus aureus*, *Salmonella*, *Clostridium perfringens*, and *Streptococcus pyogenes*. It is important to note that bacterial spores and some heat-resistant microorganisms may survive the pasteurization process.

MUSCLE FOODS

Foods from animal origin, such as ground beef, chicken and turkey products are considered a source of some food-borne disease microorganisms, especially *Salmonella*, *S. aureus*, and *C. perfringens*. In 1979, poultry contributed 11.4% of salmonellosis outbreaks and 18% of staphylococcal intoxication outbreaks (11). Table 1 shows the incidence of *Salmonella*, *S. aureus*, and *C. perfringens* in some potentially hazardous foods. As one can see, these food-borne disease microorganisms are frequently isolated from chicken, turkey, and ground beef. With the exception of *Salmonella* in ground beef, the percentage of positive samples is between 20 to 84%. These figures indicate the prevalence of these pathogens and only reinforce the need for preventive measures, especially to check their multiplication. *Salmonella typhimurium* and *S. aureus* were found to proliferate in a cooked chicken product subjected to refrigeration abuse and attained a level of up to 10^8 cells/g (45). The infective dose (number of organisms causing illness) of salmonellae was found to be between 10^5 to 10^9 (37,38,39). This data shows that abuse in refrigeration may lead to food-borne diseases. The generation time may also be shortened significantly if the food product is held at ele-

vated temperatures. Staphylococcal intoxication and Perfringens food poisoning are usually associated with 10^6 cells/g of food (3,5,30). As one can see, the infective doses can be easily attained if food is mishandled. It is important to note that beef, chicken, and turkey were supplied frozen to the school food service kitchen under consideration. Bacterial growth usually ceases when the temperature of the food product reaches -18°C (31).

TABLE 1. *Frequency of isolation of poisoning bacteria from muscle foods*.

Food	*Salmonella*	*S. aureus*	*C. perfringens*
	(% positive samples)		
Chicken	20 (50)[a]	80 (41)	58 (7)
Turkey	30 (22)	42 (22)	20 (22)
Beef	3 (43)	84 (14)	70 (25)

[a]Numbers in parentheses represent the appropriate reference.

CHEESE

Mozzarella, a soft cheese with a high moisture content (52-55%), is susceptible to microbial growth, especially food-borne disease microorganisms. As compared to other cheese, Mozzarella stands best in the frozen (-20°C) state. In the frozen state the product will not support microbial growth. Cheddar cheese, a hard cheese with a medium moisture content (37-39%), is less susceptible to microbial growth as compared to Mozzarella. Coagulase positive staphylococci are among the most frequent contaminants of public health significance reported in cheese. The cheese, Cheddar and Colby, associated with staphylococcal intoxications were poorly made (32). Inadequate development of acid in Cheddar cheese was found to be associated with the development of staphylococcal enterotoxin A. This led to an outbreak of staphylococcal intoxication in 1965 (60). Staphylococcal enterotoxins are heat resistant and are not inactivated by pasteurization of milk. Cheese made with milk containing enterotoxins may cause an outbreak of the disease. Donnelly et al. (13) found that 20% of 163 samples of Cheddar cheese purchased as pasteurized contained coagulase positive staphylococci. *S. aureus* may enter the milk after the pasteurization process is completed. Humans are considered the main source of the organism. Cheese has not created major problems with salmonellosis, but Colby cheese (12 to 14 days old) was found responsible for 384 cases of salmonellosis (*S. typhimurium*) in Kentucky (52). Typhoid fever outbreaks associated with cheese were reviewed by Marth (36). Botulism was associated with home-made cheese in 1953; otherwise it was not encountered in cheese between 1950 and 1977 (10). Considering that billions of pounds of commercial ripened cheese have been consumed, it is an outstanding record against botulism.

BUTTER

Butter is not a favorable medium for bacterial growth. *Salmonella typhimurium* var. *copenhagen* inoculated into butter declined in population when the product was frozen (-18°C and -23°C) (48). The introduction of milk into butter brought about a staphylococcal intoxication (43).

PASTEURIZED MILK

Pasteurization of milk using the high temperature short time (HTST) process (15 sec at 72°C), the low temperature long time (LTLT) process (30 min at 63°C) or the ultra high temperature (UHT) process (2 sec at 138°C) destroys food-borne disease microorganisms such as *Mycobacterium tuberculosis* (tuberculosis), *Coxiella burnetti* (Q fever), *Brucella* (brucellosis) and salmonellae, coagulase positive staphylococci, *Streptococcus pyogenes* and the vegetative form of *C. perfringens* and *C. botulinum*. Pasteurized milk is not sterile and, therefore, should be stored at temperatures of 4°C and below in order to prevent any proliferation of bacteria. Pasteurized milk is seldom associated with food-borne diseases. This record is remarkable when one considers that over 100 billion pounds of milk are consumed each year in the United States. Development of the Grade A Pasteurized Milk Ordinance (54) and the Interstate Milk Shippers Agreement (55) influenced the high quality and safety of pasteurized milk and its products.

CANNED FOOD PRODUCTS

Canned food products are heat-treated and rendered "commercially sterile." The minimum heat treatment given to medium and low acid foods (pH A 4.6) such as green beans and beef is designed to destroy a gross contamination (10^{12}/g) of spores of *Clostridium botulinum*. The "Botulinum Cook" or the "12D concept" adapted by the industry led to an excellent record of safety. In the early 1960's and starting in 1971, commercially-processed foods were associated with botulism. Among other food products, canned tuna, chicken vegetable soup, beef stew, and mushrooms contained *C. botulinum* or its neurotoxins. Lynt et al. (35) indicated that this may have happened due to faulty processing. Canned acid (pH 4.5 to 3.7) and high acid (pH $<$ 3.7) foods are given a less rigorous heat treatment than low acid foods. The spores of *C. botulinum*, and some other spore formers, are killed more quickly in acid foods than in foods of low acidity (2).

DRY FOODS

Dry food products are low in moisture and have low water-activity, therefore, they do not support proliferation of microorganisms, especially those of public health im-

portance. If these products are kept dry (N 13% moisture) no public health problem arises. If the moisture exceeds 13%, some molds may develop and produce mycotoxins that are known to be human health hazards (20). Several pasta products have been recalled because they were contaminated by salmonellae. Over 6% of 909 samples of noodles and macaroni examined by the FDA (between 1969 and 1971) were contaminated by salmonellae (57). This example shows that one should distinguish between the ability of a pathogen to proliferate and its ability to survive dry conditions. Salmonellae are known to survive dry conditions.

STORAGE OF RAW AND READY TO EAT ITEMS

The purpose of storage of raw and ready-to-eat foods at low temperature is to increase their shelf life and to reduce the chances of bacteria of public health importance to attain levels or produce toxins associated with diseases. Cooked items must be cooled as fast as possible so that the center of the food mass will be out of the range of the "danger zone" of temperatures (4°to 60°C). Cooked foods receive a heat treatment which destroys a majority of their bacterial populations. Those that survive, mainly spores, will find no competition and, if given adequate conditions, they will proliferate to dangerous levels or produce enough toxins to cause illness.

In the school food service system under consideration, food products requiring frozen storage were placed in a walk-in freezer set at -12.2°C. Refrigerated products were kept in an 8.8°C refrigerator. The food products were rotated on the basis of "first in first out." The food items were stored in foil-covered shallow pans, plastic bags, or in jars. There was enough space in the refrigerator to allow for the food to be at the designated temperature.

The highest recommended temperature for a freezer is -18°C, while commercial refrigerators are usually run between 4°and 7°C (44). Refrigeration temperatures are considered those between 0°and 7°C (31). It is probable that due to excessive use of the cold storage area in the present school food service system, the temperature fluctuated upward to 8.8°C. It is important to note that in any phase of preparation, foods should be kept out of the "danger zone." Within the "danger zone" of temperatures, bacteria multiply, and those of public health significance may attain levels or produce toxin(s) associated with food-borne diseases. Temperatures below the "danger zone" (< 4°C) assure the safety of foods from most but not all food-borne disease bacteria. The nonproteolytic strains of *C. botulinum* (type E, some of type B, and some of type F) and *Yersinia enterocolitica* do proliferate at refrigerator temperatures. *C. botulinum* types E, nonproteolytic type B, and nonproteolytic type F multiplied and produced toxin at 3.3°C within 36 (46), 40 to 60 (15) and 129 days (16), respectively. *Y. enterocolitica* attained high levels at 3°C in beef, lamb (26) and milk (49). Therefore, refrigeration cannot be relied upon as a complete safeguard against all food poisoning microorganisms, but it is one of the most important safeguards available. Improper holding temperature of foods was the number one factor contributing to food-borne disease outbreaks (11). Thus, it may be advisable to store potentially hazardous foods at temperatures at or below 0°C but above the freezing point of foods (about -2°C).

FOOD PREPARATION

A large amount of handling was involved in food preparation in the school food service operation under consideration. For example, cake batter was handled with bare hands. Only 2 food handlers were observed to wear gloves; none had hair nets or coverings.

Food handlers should not touch food with hands. Hands may contain transient food-borne pathogens that are acquired by fingering the nose, brushing the hair, touching dirty equipment, eliminating wastes, or handling raw foods (34). The food handler is an important source of contamination. Healthy humans are a potential source of *Staphylococcus aureus* (skin, nose, mouth, and throat), *Salmonella* and *Clostridium perfringens* (both from the intestines). Hands with infected cuts or burns are a source of *S. aureus* and *S. pyogenes*. Coagulase positive staphylococci were found to change from transient to resident when food handlers were contaminated (47). *Escherichia coli* is found more commonly on the hands of food handlers (10 to 38%) as compared to non food handlers (3.6%). This organism may remain on finger tips for a long time. Large numbers of staphylococci and streptococci were also recovered frequently from hands of food handlers (29). Hair nets, head or hair coverings, or restraints are required to be worn by persons preparing or serving food. Food handlers should avoid putting hands to the hair. Disposable gloves can be a barrier between contaminated hands or infected lesions and food. They are valuable especially when handling cooked foods or foods which will not be subsequently heated (such as salad ingredients). The disposable gloves should be worn only for the task for which they are provided and discarded when they become soiled, punctured or torn, and after having been used in performing other tasks.

Foods not requiring cooking, such as salad, will have some natural microbial populations. A lettuce leaf may have a microbial population of 1 to 2 million/g (2). Most microorganisms on plants are bacteria (33). The food-borne disease bacteria of major concern on fresh vegetables are *Salmonella* and *Shigella*. Gastrointestinal viruses are not of diminished public health importance. Each step of handling food potentially increases its contamination. Foods which do not require cooking, such as salad, must be prepared with a minimum of handling or contact with preparation surfaces. Vegetables and other ingredients for salad should be first thoroughly washed. Washing re-

moves most of the casual contaminants (microbes, pesticides, etc.). After the food handler washes the hands and the preparation counter, then the cleaned vegetables and ingredients are peeled, trimmed, and prepared (23). Once prepared, the raw foods should be refrigerated at 4°C or below at once. If any degree of contamination has occurred, refrigeration will prevent any great increase in numbers of microorganisms before the food is served (24). It should be noted that chopped vegetables have a larger surface area and leak nutrients: both factors may enhance microbial growth. Vegetables for salad were delivered chopped to the school food service visited.

In recent visits to the school food service operation, no cleansing of cans (canned foods) before opening was observed. Cleansing of cans is imperative, since dust and other contaminants may be introduced into a food product that is commercially sterile and, in some cases, receives little if any heat treatment before consumption.

HOLDING AND TRANSPORTATION OF FOODS

In the school food service operation visited, insulated boxes, on wheels, are used to transport the food from the central kitchen to satellite schools. Each box can be electrically heated. Serving trays were transported uncovered to satellite schools.

Since, even under sanitary conditions, most foods normally contain some bacteria, they must be handled in such a manner to prevent multiplication of bacteria, especially those of public health importance. It is important to keep foods out of the "danger zone" (4°to 60°C), to prevent bacterial multiplication. Hot foods for serving should be held at or above 60°C after preparation and cooking (8). This is achieved in school food service systems by placing pans full of hot food into a steam bath or steam table, or hot holding cabinet for transportation, holding, and serving. Insulated and/or heated cabinets should be used to transport hot food from a central kitchen to satellite schools to maintain food temperature at or above 60°C during transit. Cooked food should never be left in an unheated oven for any period of time. Insulated and/or refrigerated cabinets or trucks should be used to transport cold food from a central kitchen refrigerator to satellite schools to maintain food temperature below 7°C during transit (1). Hot and chilled food transported in the same vehicle may exchange heat (transfer of heat to cold foods and vice versa), and this may have undesirable effects in terms of public health.

SERVING FOOD

In the present school food service operation, students went through the serving line and picked up uncovered silverware from holders. Transfer of microorganisms from hands to silverware, other than one's own, becomes a reality. Napkin containers were refilled with bare hands. Food items were not shielded from students. Food was not saved for serving the next day; rather it was served as "seconds" to students. This positive practice eliminates the problems associated with handling leftovers. It is recommended not to reserve potentially hazardous foods (51). The FDA (18) requires that tableware be either prewrapped or stored with the handle of the utensil facing upwards in a container (the holder protects surfaces which come in contact with food or the mouth from contamination). Items such as napkins should be handled in a manner which would avoid surfaces that contact the mouth. An attempt was made to solve this problem in the present school service operation by wrapping the silverware with napkins. This prevents everyone from touching the silverware, and thus reduces the chances of microbial contamination.

Foods served from a buffet should be protected during display by a transparent shield over and in front of the food. The shield should adequately protect the food from handling by the customer and from sneezes, coughs or other customer-originated contamination, especially of food-borne microorganisms (23).

CLEANING AND SANITARY PRACTICES SERVING/EATING UTENSILS AND EQUIPMENT

In the school food service operation under consideration, equipment such as baking utensils were scraped, hand cleaned, and some pieces were soaked prior to their final cleaning. Automatic dishwashing and drying are capable of cleaning serving trays.

It is recommended (18) that serving/eating utensils and equipment should be thoroughly washed and disinfected. Washing, using a hot (at least 60°C) detergent solution, removes food particles and prevents an increase in microbial populations, especially food-borne disease agents. The next step in manual washing and sanitizing is to rinse free of detergent and then sanitize by either 77°C water (at least 0.5 min) or chemical sanitizers such as hypochlorite (50 ppm available chlorine for at least 1 min) and iodine (12.5 ppm available iodine for at least 1 min) at 24°C. Immovable equipment, covered metal containers, mixers, etc., should be sanitized by either exposure (10-15 min) to steam or to a chemical sanitizer (at least 5 min), rinsed with clean water and dried (27). Experience shows that serving/eating utensils and equipment washed in this manner are not always bacteriologically clean (51). Because of lack of knowledge and lack of supervision, a dishwasher may be satisfied if the utensils and equipment look clean. Bacterial counts can determine the cleanliness of utensils/equipment. For example, bacterial counts above 100 colonies mean unclean utensils, while counts of 100 colonies or less are acceptable.

Those showing 30 to 100 colonies, however, indicate the need for improving the sanitary situation (58). Food deposits or films may provide a microenvironment for growth of microorganisms. For example, a visibly clean meat slicing machine had an unacceptable bacterial count of 10^6 to $10^7/cm^2$ (21). Thus, the cleaning and sanitizing method, in that case, was ineffective in reducing bacterial loads. Special attention should be given to chipped, cracked or dented utensils. Such damage provides hiding places for food particles and microorganisms. It is more difficult to clean and disinfect damaged utensils, and therefore it is more difficult to prevent food-borne diseases. It is recommended not to use damaged utensils (23). Mechanical cleaning and sanitizing may be done by spray, immersion, or any other type of dishwashing machine. Utensils/equipment parts placed in the dishwashing machine must be exposed to all cycles (51). The water must be at a temperature of 60° to 74°C (depending on the machine used) during washing and at 82°C (except for single temperature machines) for final rinse (18,24). According to the Center for Disease Control, 27 and 10% of reported food-borne outbreaks, in 1979 and 1981 respectively, were caused by unsanitary equipment (11,12).

LAUNDERING

During the visits to the present school food service operation, it was noticed that soiled towels, aprons, etc. were collected in the afternoon and washed early in the morning for use in that day.

Towels are a dangerously effective way of spreading food-borne disease microorganisms from person to person. Dish towels and other wet fabric items are sanitary risks because of the abuse they undergo. For example, wet mops were found to support bacterial growth to high populations (59). Among these one may find food-borne disease agents. Thus, it is wise to minimize the use and abuse of towels and fabric items as much as practical. According to Banwart (4), laundering does not remove all of the microorganisms from fabrics. The effectiveness of laundering depends upon the type of organisms, fabric, temperature, detergent, antimicrobial agents, bleaches, flushes, rinses and drying. Viruses tend to adhere to the fabric and are difficult to remove. Microorganisms tend to remain viable in wool longer than in cotton. Synthetic fabrics require less drastic laundering, allowing greater microbial survival. On the other hand, microorganisms do not survive on synthetic fabrics as they do on cotton or wool. During laundering, microorganisms are transferred among the towels, clothing, and other fabric items in the same wash load. It is possible that there will be a carry over of microorganisms from one load to the next.

TOILET

The toilet facilities in the school food service operation visited were properly equipped, including sanitizer dispensers. Signs and symbols were available to remind all persons to keep clean. One of those signs stated: "If You Are Sick Do Not Work."

The literature reports that fecal organisms can be found on various surfaces in toilet facilities (door handles, flush handles, tap handles, toilet seats, and floor). Tap handles were reported to be more contaminated than door handles (40). The wash basin overflow was reported to be more contaminated than the floor or the area under the rim of the toilet. A person with *Salmonella* or *Shigella* infection could contaminate various surfaces in a washroom or toilet. These areas could conceivably serve as a source of contamination for other people. Handwashing can effectively remove transient food-borne pathogens. Bacteria are removed in the course of handwashing, not by bactericidal action of the soap, but by the combination of the soap emulsifying action on lipids and other oils and grease, the abrasive effect of rubbing, and the effect of wash water in carrying away the loosened, dispersed, entrained particles and organisms (23).

SUGGESTED CRITICAL CONTROL POINT SYSTEM

On the basis of the present study of this school food service operation, it is suggested to use a critical control point (CCP) system as summarized in Table 2. Most of the phases in food preparation (except for procurement,

TABLE 2. *Suggested CCP system for the school food service operations.*

Phase	Critical Control Point			
	Raw Materials	Time-temperature Combination	Sanitation	
			Personnel	Equipment
Procurement	+[a]			
Storage		+		+
Thawing		+		+
Preparation		+	+	+
Heating		+		
Holding		+		
Portioning		+	+	+
Distribution		+	+	+
Heating		+		
Serving		+	+	+

[a]The sign + represents the CCP applicable to the phase.

heating, and holding) will be controlled by at least 2 CCP, including time-temperature combination, sanitation of personnel and equipment. Procurement will be controlled through the raw materials, while heating and holding by appropriate time-temperature combinations. Every CCP will contribute to the reduction or elimination of health hazards of microbial origin. Microbial guidelines may be established for a particular CCP by districts, counties or states. Recommendations for time-temperature combinations and sanitary practices can be based on those of the FDA (18).

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Recovery of *Vibrio cholerae* 01 After Heating and/or Cooling

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Foodborne transmission has accounted for practically all cholera infections in this country in recent years, and foodborne transmission of this disease has been more often reported world wide. Foods most frequently contaminated and incriminated in the transmission of the infection have been seafoods, commonly oysters and crabmeat. However, because Vibrio cholerae *survives relatively well in water, and many outbreaks have been waterborne in the past, there is always a good possibility that foods may be contaminated in the home by the use of water containing the organisms. In view of these situations, it is of public health importance to know how* V. cholerae *may survive in different kinds of foods under different circumstances. The purpose of this study was to determine the recoverability of* V. cholerae *01 strains after heating to temperatures which may frequently be involved in reheating foods, and after cooling to both refrigeration and freezing temperatures. Foods used for heating studies included rice, poultry, and fish; and for the refrigeration and freezing studies cooked picked crabmeat was used. Recovery of the organisms in these experiments indicate that there is some public health danger associated with food contaminated by* V. cholerae *01 strains which is insufficiently reheated; or which is cross-contaminated during processing and is then cooled and stored.*

INTRODUCTION

In 1973 the first non-laboratory related case of *Vibrio cholerae* infection in the United States in seventy-two years was confirmed in a male patient living on the Texas Gulf Coast (1). The actual source of infection in this patient was never determined, but since the patient lived near brackish water and drew drinking water from a nearby well, it may be assumed that in this instance that the ultimate source was water. Since 1973, there have been thirty-four confirmed cases of *V. cholerae* 01 infections in the United States, primarily in the coastal region of the Gulf of Mexico (*1,2,3*). All strains of the organism isolated from these cases were classified as Inaba strain, El Tor biotype. Twenty-one, or 54% of the cases have been either strongly associated with or directly connected to seafood organisms from the Gulf Coast which have been improperly cooked or improperly stored after cooking. Crabmeat was considered to be the source for twelve of the twenty-one cases, and oysters were considered to be the source for seven cases. Several studies have been carried out to determine the survivability of *V. cholerae* strains in various foods (*4,5,6*), and it has been shown that this organism can be recovered from ground coffee, tea leaves and yogurt for no more than one hour, but can be recovered for up to two weeks from milk, icecream and butter at room temperature. Refrigeration temperatures in some cases do not greatly extend the recoverability of the organism (*4,5*).

In preparation of various foods, it is frequently necessary to use water and in many parts of the world, there is some possibility that the water may be contaminated with *V. cholerae* organisms, which in turn will contaminate the food (6). If the food is still to be fully cooked, this contamination may be of small importance since temperatures of over 100°C (212°F) will destroy other pathogenic bacteria except for spore formers. If; however, the foods are already fully cooked and are simply being reheated, it is frequently the case that the entire mass of food will not be heated to a killing temperature, and in fact, may sometimes be heated to a temperature which will simply incubate potentially pathogenic bacteria present. It is in these cases that the presence of the organisms in different foods may become a problem. FDA recommendations are that foods should be heated to 75°C (165°F) in such a manner that the entire food is heated to this temperature (*7*). In the home however, particularly in developing countries, this temperature is not reached.

Oysters are frequently shucked and then stored at refrigerator or freezer temperatures before use. Crabmeat is usually picked after boiling the crabs for at least 15 min and then may be refrigerated or frozen before use. Crabmeat used in this study was cooked at 15 lbs steam pressure (101°C, 240°F) for 8 min. This method of cooking is not unusual for commercial operations. Crabmeat so handled is often used at cool or room temperature after refrigeration or freezing, and oysters are not infrequently consumed raw after such storage, therefore any contamination present remains, and if the organisms have survived the cool temperatures, they may cause infection.

Because of these possibilities, foods were deliberately contaminated with viable cultures of *V. cholerae* and tested under varying conditions as described below to determine whether the organisms could be recovered after treatment with either heat or cold. The question of recoverability or survivability of *V. cholerae* is still open; however, based on much of the work of Colwell et al (8), it appears that in many cases the term recoverability is more accurate than survivability of these bacteria. This study does not attempt to distinguish between the two.

MATERIALS AND METHODS

Foods selected for the experiments involving warming to various temperatures were boiled rice, boiled turkey and baked fish (flounder). The fish had been buttered and had been sprinkled with paprika; the rice had been buttered; and the turkey had been boiled and was used without seasoning. Within 4 to 6 hr after the food was cooked, 20.0 gm was weighed and two ml of broth culture of *V. cholerae* (6 hr incubation) was added and warmed to temperature. The food and broth mixture was then added to a Waring blender with 100 ml sterile distilled water and blended at highest speed for 2 min.

V. cholerae 01 (Inaba) strain 569B was obtained from The University of Texas Medical Branch, Galveston, and was maintained in stock cultures on Tryptic Soy Agar (TS, BBL), containing 1% NaCl. The culture was transferred to new agar slants at approximately one month intervals, and was maintained at room temperature (25°C, ±2°; 77°F). The culture was inoculated into alkaline peptone broth (1% peptone 1% NaCl, pH adjusted to 8.5 with 10% v/v NaOH), and incubated at 35°C (95°F) for 6 hr before being used. A preliminary test showed that 2.0 ml of such broth culture would yield between 100 and 1 million organisms per ml. Two ml of this broth was used to add to the food sample prior to warming and blending.

Prior to heating contaminated food samples, samples were plated to determine the bacterial load per gm food at the time of heat treatment. The contaminated food sample was divided into six portions (one for each temperature). Heating of the samples was achieved by using a constant temperature waterbath for each temperature. The food samples were heated at the selected temperature for five min intervals. The maximum heating time was 20 min. After each 5 min interval of heating, with constant mixing, 5 ml aliquots were withdrawn and plated on Thiosulfate Citrate Bile Sucrose (TCBS) agar plates using the spread-plate technique. Plating was done at dilutions of 1/1, 1/100, 1/10,000, and 1/1,000,000. Plates were incubated at 35°C (95°F) for 24 hr. After incubation, plates were counted and the survival of *V. cholerae* was recorded.

For the studies, to determine the survival of *V. cholerae* at refrigerator and freezer temperatures, a food was selected which may be expected to be fairly commonly contaminated with these organisms, and which also may be expected to be frequently cooked, picked, and either refrigerated or frozen for various periods before it is consumed; crab meat. For this study, EDCO Quality Crab Meat, packed by E. Collins Seafoods, Inc., Palacious, Texas (Tex, State certificate of compliance #TEX 100C), was purchased in one-lb containers. This certificate of compliance is evidence that the operator of the plant meets minimum State requirements for operation of a seafood processing operation as designated by the Texas State Department of Health.

After purchase, a three-gm sample from each container was combined with three ml alkaline peptone broth, and incubated for 24 hr at 35°C (95°F). Following this incubation, the incubated samples were streaked to TCBS and TS agar plates to determine whether the crabmeat had previously been contaminated with *V. cholerae*. These media are those commonly used for isolation and recovery of vibrios from various samples (9). On culture all samples purchased for this study were negative for *V. cholerae*, of either 01 or non-01 types. Three gm of crab meat were weighed out and placed in sterile capped plastic vials. Vials were filled to permit testing at three day intervals during a 35 day test period. The same strain of *V. cholerae* (569B), obtained from The University of Texas Medical Branch, Galveston, was used for contamination of the crab meat samples for this study. In this portion of the study, however, the organism was transferred to broth for culture for 24 hr, prior to use for contamination of the crab samples. To the crab meat samples, three ml of alkaline peptone broth, and one drop of 24 hr culture of *V. cholerae* were added. Half of the vials were then placed at 5°C (41°F) and the remainder at -20°C (-4°F) for test. The remainder of the 24 hr broth culture of *V. cholerae* was divided into two portions, one of which was placed at each temperature as controls. At three day invervals, one vial was taken from each temperature and allowed to thaw at room temperature. A one drop culture was also taken from each control container at the same time. After the frozen samples had thawed, all samples were streaked to both TCBS and TS agar plates, which were incubated at 35°C (95°F) for 24 hr and checked for growth.

RESULTS AND DISCUSSION

Cultures of food samples were incubated at 35°C (95°F) for 24 hr before colony counts were made, and the number of surviving culturable cells of *V. cholerae*

were calculated. Results showed that at most temperatures, the organism survived less well in rice than in fish, and less well in fish than in poultry *(Table 1)*. A temperature of 50°C (122°F) was sufficient to remove culturable cells from contaminated rice within 20 min; however, 55°C (131°F) was required to remove culturable cells from fish, and 60°C (140°F) was required to remove culturable cells from poultry within the same time period. At 60°C (140°F) no culturable cells remained in rice or fish after 5 min of treatment. There was evidence that temperatures of 40 and 45°C (104 and 113°F) actually allowed some increase in the number of culturable cells in the rice foods samples, but not in either of the other food types.

Cultures of contaminated crab meat samples after exposure to either 5°C (41°F) or to -20°C (-4°F) showed positive *V. cholerae* growth through 35 days in three separate tests, *(Table 2)* although occasional negative cultures were obtained in samples at -20°C (-4°F) beginning as early as 28 days after exposure. This indicates that some die-off of organisms was occurring, or that some of the vibrio cells were in a non-recoverable stage as postulated by Colwell, et al (*8*). Positive cultures were obtained from broth cultures at either temperature only through the 5th to the 7th day, indicating that the vibrios became non-recoverable more rapidly in that medium than in the crab meat samples.

Results obtained in these studies demonstrate some of the public health dangers associated with the contamination of foods with *V. cholerae* after the foods have been cooked. It is apparent that this bacterium is relatively difficult to remove from foods if the foods do not undergo full cooking after contamination. Re-heating foods to moderate temperatures does not always completely eliminate the organism, and depending upon the food type and the warming temperature, may actually serve to incubate and to allow an increase in the numbers of bacterial cells.

Crab meat is an example of a special case situation in cholera infection transmission. The crab may be commonly contaminated with *V. cholerae* cells when it is removed from its natural habitat. It is common practice to carry live crabs in ice chests to the place where they will be cooked. When crab is boiled, all *V. cholerae* cells may very well be killed; however, if the crab is then

TABLE 1. *Culturable counts of* V. cholerae *after heating in different types of foods. All counts are means of duplicate plates in at least six trials* $\times 10^3$.

	TEMPERATURE °C														
	45			50			55			60			65		
Time in minutes	Food Types*														
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Control 0	73	132	150	73	132	150	73	132	150	73	132	150	73	132	150
5	140	110	250	30	30	82	4	14	120	.01	3	14	0	0	0
10	117	66	120	8	24	3	.9	5	.9	0	.5	0	0	0	0
15	7	13	760	2	1	.7	.2	.9	.5	0	0	0	0	0	0
20	4	1	10	0	.4	.1	0	.04	0	0	0	0	0	0	0

*Food Type 1 = Rice.
Food Type 2 = Poultry.
Food Type 3 = Fish.

TABLE 2. *Recovery of* V. cholerae *from contaminated crabmeat after storage at different temperatures. Composite results of six tests.*

	Temperature in °C					
	5			-20		
	Crabmeat		Control	Crabmeat		Control
Day of Test	TCBS*	TS*	TCBS*	TCBS*	TS*	TCBS*
1-7	+	+	+	+	+	+
8-20	+	+	−	+	+	−
21-25	+	+	−	+	+	−
26-28	+	+	−	±	+	−
28-32	+	+	−	±	+	−
33-35	+	+	−	±	+	−
35-38	+	+	−	±	+	−

*Samples from test vials streaked to thiosulfate citrate bile salts sucrose agar (TCBS) or to trypticase soy (TS) agar plates and incubated at 35°C for 24 hours. ± indicates negative cultures on some days and positive cultures on other days during this time.

returned to contaminated environments, the organisms may be reestablished on the surface of the animal, and as meat is being picked, it may be recontaminated. It is apparent from the results obtained in this study, that if the crab meat is recontaminated, neither storage at refrigerator nor at freezer temperatures will cause a rapid die-off of the organisms. Since the meat is already cooked, it is likely to be consumed with no additional heating and, in fact, during the process of thawing, the numbers of *V. cholera* cells may actually have increased, thereby enhancing the opportunity for infection of the consumer.

Based on results of these studies, it is to be recommended that left-over foods should be thoroughly heated to a temperature of at least 75°C (165°F) for a very short period of time before being consumed, and that unboiled water *not* be used in the heating process in those areas where water supplies are not adequately treated. In the use of crab meat, it is essential that boiled crabs *never* be stored in possibly contaminated containers (especially those which have been used for storage of the freshly caught crabs), and that strict sanitary practices be followed in picking and packing cooked crab meat. It is advisable, in those areas which have been subject to periodic outbreaks of *V. cholerae* 01 or non-01 infection outbreaks, that commercial establishments involved in packing and sale of picked crab meat should spot culture samples of the product to assure that contamination has not occurred.

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Combined Health District Wins National Consumer Protection Award

The 1985 Samuel J. Crumbine Consumer Protection Award for excellence in a program of food protection at the local level has been awarded to the Combined Health District of Montgomery County, Ohio.

Presentation of the Award was made at the Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians in Nashville, Tennessee on August 7, 1985.

The Crumbine Award is designed to bring national recognition to a local health authority which has demonstrated outstanding achievement in the design and execution of a comprehensive food protection program in the preceding year. The Award is sponsored by the Single Service Institute, Inc., the national trade association of manufacturers of disposables for food service and packaging.

Accepting the Award on behalf of Montgomery County was David Peden, Director of the Environmental Health Division; Terry Wright, Bureau Supervisor of General Services; Mark Case and Don Martin, area sanitarian supervisors; and sanitarian Alan Pierce.

The Award was presented by Charles Felix, Director of the Environment and Health Committee of the Single Service Institute. In making the presentation, Mr. Felix said: "The Combined Health District of Montgomery County, which serves the city of Dayton and other communities located within Montgomery County in the southwestern part of Ohio, has a food protection program that deserves to be singled out for our attention and appreciation. It is at one and the same time a model for other jurisdictions to emulate and a prime example of the excellence to be found in public health at the local level."

The Crumbine Award winner is selected by a panel of seven jurors made up of public health professionals and consumer representatives.

The Award is named after Dr. Samuel J. Crumbine, the pioneer health officer who outlawed the common drinking cup is his state of Kansas in the early 1900s.

Water Conditioner Aids in Cutting Chemical Costs

Dairymen and processors around the country are finding the AQUA-FLO non-chemical water conditioner an amazing aid in cutting chemical costs, providing clearer sanitary systems and reducing algae growth in all water systems. Whether your problem is calcium scaling, stuck valves or high chemical costs, AQUA-FLO can help.

A unique approach allows this device to enhance flavor, make water seem "wetter" and retain solids in solution longer than normal - all without chemicals. Available in line sizes 3/4" to 3". If you're looking for more efficiency in your liquid lines and want to reduce scaling, corrosion and chemical costs, call toll free, 1-800-368-2513 or write AQUA-FLO, INC., 6244 Frankford Avenue, Baltimore, MD 21206.

UDIA Appoints New Chief Executive Officer

Edward A. Peterson is the new chief executive officer for United Dairy Industry Association (UDIA). Peterson's appointment was approved by the Board of Directors September 6, following an 8-month search involving an outside consulting agency.

Peterson joined UDIA in January, 1981 as a market consultant. He served as senior vice president, Industry and Member Relations, and in April, 1983 was named executive vice president, Operations. Peterson had been acting chief executive officer since the January resignation of John W. Sliter.

The new chief executive officer is actively involved in Dairy Promotion Federation Association efforts aimed at unifying the dairy industry nationwide and was a member of the Organizational Study Task Force appointed by UDIA Chairman James P. Camerlo.

Before joining UDIA, Peterson had served as executive secretary of Milk Promotion Services, Inc. since 1970 when it became a member organization of UDIA. From 1963-1970, he was manager of American Dairy Association of Vermont.

A native of Franklin, Massachusetts, Peterson holds a B.S. degree in agriculture from the University of Vermont. He and his wife, Bonnie, currently live in Arlington Heights, IL.

UDIA conducts a total dairy product promotion

program that includes advertising and marketing activities by American Dairy Association, nutrition research and nutrition education by National Dairy Council, and product and process research and development by Dairy Research Inc. Its membership represents 95 percent of the nation's dairy farmers and 86 percent of the milk marketed.

McGowan Named Assistant Professor of Toxicology

Dr. Claude McGowan has been named Assistant Professor of Toxicology in the Food Science and Human Nutrition Department, Institute of Food and Agricultural Sciences, at the University of Florida in Gainesville, FL.

Dr. McGowan received his B.S. degree in Biology from Tuskegee Institute in 1973 and his M.S. in Veterinary Science from the same institution in 1982. His Ph.D. was granted in Toxicology from North Carolina State University, Raleigh, in 1985.

His experience includes over three years as a Medical Research Technician, U.S. Army Research Institute of Environmental Medicine, Natick, MA, and Pharmacology Research Technician at the University of South Alabama, College of Medicine in Mobile, AL.

Dr. McGowan has published on aflatoxicosis and on the effects of lead toxicity.

Dr. McGowan has been the recipient of the Public Health Service Fellowship and a National Science Foundation Fellowship, and has received the Graduate Dean's Afro-American Academic Achievement Award from North Carolina State University in 1983.

Milk Production and Consumption Up; Prices Down

Consumption of dairy products is up, but farm milk prices will come down, predicts Jerome Hammond, agricultural economist with the University of Minnesota's Agricultural Extension Service. The reason is increased production is forcing continued high purchases by the Commodity Credit Corporation (CCC).

Commercial use of dairy products has continued to show annual increases, which Hammond says is due to lower retail prices, increase in real per capita income, population expansion and expanded promotional programs for dairy products. An expected 1.5-percent increase in commercial use this year would amount to 128.9 billion pounds.

On the basis of current trends, total 1985 milk production will be about 139.5 billion pounds, 3 percent above last year's total and exceeding commercial use by 11.1 billion pounds. The CCC will need to purchase this to maintain the support price of $11.60 per hundredweight (cwt.), with total cost approaching $1.5 billion.

The effective producer milk price for the first six months of 1985 increased 7 cents per cwt. over the year's earlier level. However, with reduced support prices in April (from $12.60 to $12.10 per cwt.) and July (from $12.10 to $11.60 per cwt.), the U.S. average 1985 producer price is expected to be 20 to 40 cents per cwt. below that of 1984.

The dairy situation in 1986 will depend to a large extent on the dairy program that emerges from Congress in early fall. Without supply control, production will continue to exceed demand. Producer milk prices, depending on the dairy program, will be at the current $11.60 per cwt. at best and, at worst, 50 cents to $1 under that level. Prices will not affect production until late in 1986, so look for the milk supply in 1986 to increase 2 to 4 percent.

More detailed information is available in the Ag Outlook insert of the Sept. 21 issue of "The Farmer/ The Dakota Farmer" magazine.

Milk Promotion Will Continue Despite Disappointing Results

Dairy farmers will likely continue paying for a national dairy promotion program, despite a study that raises questions about its effectiveness, says a University of Wisconsin-Madison dairy policy specialist.

The study, conducted by Arthur D. Little, Inc. for the National Dairy Promotion and Research Board, concludes that "generic advertising has a positive and statistically significant effect on fluid milk sales." The firm estimates that the $15 million spent on the board's national advertising program will increase fluid milk sales by about 130 million pounds in 12 regions surveyed. The 12 regions comprise about 43 percent of the U.S. population.

But Ed Jesse of the Department of Agricultural Economics says this return on investment isn't large enough to warrant the cost of the advertising program. The 130-million pound sales increase amounts to only a 16 to 22 cent per dollar return if milk is valued according to the price differential between fluid and manufacturing milk, he says. Fluid milk brings about $2 more per hundredweight nationwide than milk sold for manufacturing.

During August and September, dairy farmers will vote on whether the program should be continued. The referendum was mandated by the Dairy and Tobacco Adjustment Act of 1983 - the legislation

that established the $200 million dairy product promotion, nutrition education and research program. Dairy farmers are assessed 15 cents for every hundred pounds of milk they produce to finance the program.

Jesse says the program will probably be continued because dairy co-ops intend to cast bloc ballots in the referendum. Co-ops representing more than half of all U.S. milk producers have already cast bloc votes in favor of the program. Individual producers may cast ballots contrary to their co-op's position, but that's unlikely, he adds.

"Farmers can see where their money's going with the ads, and they like what they see," he says. "There is a psychic, nonmonetary value to the ads. Farmers are proud of the ads. They are getting their story across; the ads are image-building."

"Co-ops favor the ads because - at least in their capacity as milk-processors - they operate on a margin and would be interested in any increase in consumption regardless of the return to individual members. Increased volume both improves their gross returns and reduces their cost per unit."

Jesse says there are some positive notes to the study's findings. For instance, the study showed that increased sales of fluid milk came early in the campaign and then began to taper off.

"With any product, there is some saturation level, and with milk you may be hitting that early," he says. "But that may be favorable. It indicates that we may be able to spend smaller amounts in more markets and take advantage of that initial increase to gain more income."

Professor Spends Year in Food Science & Human Nutrition Department

Dr. William E. Sandine, Professor of Food Microbiology at Oregon State University is spending a sabbatical year in the Food Science and Human Nutrition Department, Institute of Food and Agricultural Sciences at the University of Florida in Gainesville, FL.

A native of Iowa, Dr. Sandine received his B.S. in Dairy Industry from Iowa State University in 1950, and his M.S. from North Carolina State in Dairy Manufacturing in 1955. His Ph.D. was granted from Oregon State University in Microbiology in 1958.

He remained at Oregon State University as an instructor for one year and then conducted post-doctoral research at the University of Illinois. In 1961 he returned to Oregon State University where he is now Professor of Microbiology.

Dr. Sandine has published extensively in the area of lactic acid bacteria and starter culture research. He is a co-author of a major text in the *Microbiology of Foods*, the holder of numerous patents, and the recipient of many awards. He is sought after extensively for presentations and committee contributions. He has received seven prestigious awards for his excellence in research.

New Product News

The products included herein are not necessarily endorsed by Dairy and Food Sanitation.

Bacterial - Fungal Tests Detect Microbial Contamination

• Miles Environmental Test Systems, manufacturers of Mycostix® and Biostix® fungal and bacterial dip-strip detection kits, reports a dramatic increase in interest by machinists, chemical engineers, lab technicians and food processors, in their dip-strip products for detecting microbial contamination. Users continue to report these products are "easier, faster, more economical, and every bit as accurate" as media filled petri dishes and agar dipsticks.

Biostix bacterial and Mycostix fungal test strips are designed for industrial machining operations involving the use of metalworking fluids. The strips may also be used to determine microbial contamination in cooling towers and other industrial waters as well as in food processing. Company officials point out that classical methods require expensive equipment and training, while Mycostix/Biostix are "virtually as easy as 1-2-3 to use."

The first step in detecting and counting fluid or surface contaminants is to simply dip the strip into the fluid sample or wipe over on the surface to be tested. Second, the contaminated strip is placed in a special pouch for incubation. And finally, results are read by visually comparing the reacted strip to the interpretive chart provided on the package. The easy-to-follow instructions enable *all* on-site personnel to perform and evaluate the tests. No advanced training, costly equipment or lab facilities are necessary.

Additional information can be requested by contacting: Miles Environmental Test Systems, Miles Laboratories, Inc., P.O. Box 40, Elkhart, IN 46515.

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Lactic Acid Kit Now Available

• A test kit for the enzymatic determination of Lactic Acid in a variety of materials is now available from Boehringer Mannheim Biochemicals.

With this kit, Lactic Acid may be determined quickly and accurately with minimal sample preparation. Working procedures are available for a variety of foods, and for the differentiation of D from L forms of Lactic Acid.

For more information contact: Rowland Kenna, Boehringer Mannheim Biochemicals Research Kit Department at 800-428-5433 (in Indiana call collect, 317-849-9350).

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CDT Device Tests Pressure Switches

• The need for an accurate and convenient means of testing Pressure Differential Controllers without manual manipulation of Bourdon Springs or the pointer arm linage led to the development of the *CDT Device*.

The *CDT Device* can be used by regulatory agencies to pneumatically test all types of pressure switches used to control the operation of booster pumps on High-Temperature-Short-Time-Continuous-Flow (HTST) Pasteurizers.

It has been proven valuable, convenient, and a time-saving service tool for maintenance people when calibrating and adjusting sanitary pressure differential controllers.

The unit makes use of:

• two pressure regulators and two gauges, the larger of which is accurate to 1/2% across the 0-100 psig scale.

• an air inlet connection and two output air lines (for connection to the sanitary pressure sensors of the differential controller).

These components are mounted in a steel case for their protection and transportation. A handle is provided for portability. The case measures only 10"x10"x5". A removable filter and moisture trap is integrated into the air inlet connection.

For more information contact: The Crombie Company, 521 Cowles Avenue, Joliet, IL 60435. 815-726-1683.

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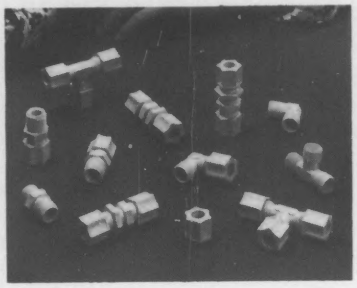

Plastic Fittings Available For All Types of Metal Tubing

• A line of plastic fittings suitable for use on all types of metal and plastic tubing are available in many configurations. The fittings are said to cost less than metal fittings, and absorb mechanical and acoustic vibrations better, because they have low densities. They also are inert to galvanic action which occurs when metal fittings and tubing of dissimilar metals are connected together. The fittings can be used with copper tubing, aluminum or steel tubing, as well as plastic tubing. Made in 1/4" thru 5/8" tube O.D. sizes, they are manufactured in nylon, polypropylene, acetal or Kynar. Nylon fittings have good resistance to organic solvents, oils and gasoline and retain good strength at high temperatures. They are ideal for both cold and hot-water applications, and stand up well to long-time weathering.

Polypropylene fittings are the lowest in cost and can withstand continuous temperatures up to 290°F. They are opaque, and unaffected by most weak acids and alkalies.

Acetal copolymer fittings have high tensile strength and good impact resistance over a broad temperature range. They are not affected by continuous hot-water service, and work smoothly with metal tubing. Acetal fittings have been cleared by both the USDA and the FDA for use with coffee, milk and antibiotics.

Kynar fittings are used in applications that require excellent resistance to halogens, oxidants, strong bases and acids. The material has high tensile and impact strength and resists fatigue, creep and abrasion.

All types of configurations are available, including male, female and bulkhead union connections; reducing unions, male, female and union elbows; male branch, male run and union tees; and ferrule nuts and inserts.

For more information write for catalog GOSP, Jaco Manufacturing Co., 468 Geiger Street, Berea, OH 44017. 216-234-4000.

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Food Science Facts
For The Sanitarian

Dr. Robert B. Gravani
Cornell University
Ithaca, NY

FOOD DETERIORATION AND SPOILAGE CAUSED BY LIGHT

A wide variety of foods can undergo changes in color, flavor and nutrient composition when exposed to light. The extent of these changes depends on many factors including the composition of the product and the light source. Not all types of natural or artificial light are equally absorbed or equally destructive. The effects of light on a variety of foods will be discussed.

Milk

Increased interest in the nutritional quality of foods has led to concerns about the packaging and handling of milk due to its light sensitivity. Milk is merchandised in retail stores under high intensities of light that can cause considerable photodegradation of milk constituents. This exposure can result in distinct flavor changes as well as the loss of added Vitamin A, Riboflavin and Vitamin C (ascorbic acid).

The off-flavors that develop in milk on exposure to light are called "sunlight" flavors that result from the breakdown of amino acids and proteins. Another type of light-induced off-flavor in milk is called "oxidized" flavor. This defect occurs when unsaturated fatty acids in milk lipids undergo oxidation.

The light-induced changes in milk depend on the intensity of the light, the type of container, milk composition, agitation and several other factors. Loss of quality is most rapid in clear glass, polycarbonate containers and polyethylene jugs. The use of opaque fiberboard containers offers almost complete protection against light. Pigmented plastic containers can also protect against light. Currently, some companies are using either white opaque or cream colored plastic jugs to protect the quality of their milk.

Milk in polyethylene containers showed a 90% reduction in added Vitamin A after twenty-four hours of exposure to fluorescent light. The loss of Riboflavin under the same conditions was much slower; an 8% loss in Riboflavin was observed after twenty-four hours of exposure. The light-induced destruction of both these nutrients increases as the fat content of the milk decreases. In addition, milk exposed to light also shows a significant drop in Pyridoxine, Vitamin B_{12} and Vitamin C.

Meats

Fresh meats that are exposed to oxygen usually have a desirable, cherry red color. When exposed to visible light for long periods, the pigment at the surface of the meat is slowly changed to a brownish gray color. Ultraviolet light causes a rapid fading of fresh meat color as well as accelerating the development of rancidity in the meat fat.

Cured meats like ham and luncheon meats undergo a more rapid light-induced color change than do fresh meats. Cured meat contains nitrite which combines with natural meat pigments to give these products their characteristic pink color. On exposure to light in the presence of oxygen, these nitroso-compounds are converted to a brownish gray color. This undesirable color is called light fading and it can be prevented by vacuum packaging the meat, packaging it in oxygen impermeable films or by using opaque packaging materials.

Fats and Oils

Exposure to sunlight and/or fluorescent light accelerates the degradation of vegetable oils, butter, lard and similar products. Light appears to accelerate the autoxidation of fats and oils, resulting in flavor and odor changes. It is thought that light-absorbing compounds in these foods sensitize them to visible and ultraviolet light. Fats

and oils have different sensitivities to light depending on their composition, the different amounts and types of sensitizers present and the protective effect of other constituents.

Beer and Wine

When beer is exposed to light, it develops an undesirable flavor (and odor) called "sunstruck" flavor. This is why most beer is bottled in dark containers. The light-induced flavor is caused when constituents of the hops used to make the beer react with breakdown products of sulfur containing amino acids. The resulting compounds are responsible for the "sunstruck" flavor. One company has developed a unique process to prevent sunstruck flavor and has successfully packaged beer in clear bottles.

Light often causes color changes in wine and that reduces consumer acceptance. The sensitivity of wines depends on the type of wine and the color of the bottle it is packaged in.

Snack Foods

Snack foods (like potato chips), prepared by deep fat frying in oils are susceptible to photodegradation and develop off-odors and off-flavors on exposure to light. Snack foods in opaque packages retain their quality longer than those packaged in clear, polyethylene bags.

There are only a few classes of foods that are susceptible to the action of light. There are several things that can be done to reduce the photodegradation of foods; the food industry can:

- reduce the exposure of sensitive foods to light;
- package foods in selectively absorbant or opaque packaging materials;
- reduce the oxygen concentration to very low levels;
- decrease the level of light in display cases;
- choose lights that have low photochemical activity.

By following some of these recommendations, shelf-life can be improved and product quality can be maintained for longer times.

Dairy Quality

by Darrell Bigalke, *Food & Dairy Quality Mgmt., Inc., St. Paul, MN*

A QUALITY MANAGEMENT SYSTEM - AN INNOVATIVE APPROACH TO ACHIEVING QUALITY

Part I - Definition

In recent years the term "quality" has been a popular item of discussion for consumers, processors, suppliers, academics, and regulatory personnel. The increasing awareness of the importance of quality is forcing industry to take steps to assure quality. While production of quality products is desired by all, it is achieved by few. The reason quality is not achieved by all processors is usually due to a combination of several factors. Frequently reduced profits result from not achieving quality.

The next four *Dairy Quality* articles introduce a management system that facilitates product quality improvement while establishing improved profits as a major objective. The proposed system enables a Quality Management System (QMS) to utilize procedures that have been adopted by many food processors and to consolidate and organize their functions. The system is unique in that it assigns the quality department and the production function with identical objectives, i.e., improved product quality and profits. The four articles do not attempt to cover all parameters necessary to implement and operate a QMS. However, the intent is to introduce a system that can be utilized by the dairy industry to improve quality and profits.

Commitment, understanding, and sound management are required to overcome all of the obstacles in achieving quality. Frequently, present attempts to achieve quality are based on quality control and quality assurance functions. Usually quality control is responsible for process control, measurement of product conformance, ingredients monitoring and control, and product distribution monitoring and control. Quality assurance normally functions with responsibilities in establishing product specifications that assure consumer acceptance, regulatory compliance, and safety. For our articles, we will use these definitions of quality control and quality assurance, although any titles will serve the purpose as long as the functions are carried out. In keeping with this description of their roles, many food processors place the responsibility for production of quality foods on quality control and quality assurance departments with no responsibility for profits. In contrast, production management is responsible for production, controlling costs and generating profits with no responsibility for quality.

As a result of this inappropriate distribution of responsibilities, optimum quality is not achieved which in turn decreases profits. With quality control and quality assurance in direct conflict with production, efforts of each group are not maximized. One might say that quality assurance/quality control and production are not pulling in the same direction. While each group is addressing its assigned responsibilities, the organization as a whole may not be obtaining maximum utilization of each group. To correct this situation, the utilization of a Quality Management System (QMS) is suggested. The basis of a QMS is to define quality as conformance to specifications and to establish product and operation specifications that assure consumer acceptance, safety, and maximum profits. This system has quality assurance and quality control functioning with the same objectives as production; that is production of products that conform to specifications.

Product specifications must reflect: 1) consumer acceptance, 2) regulatory compliance and safety, and 3) economies of production and distribution. Measuring conformance to specifications provides a means of determining accomplishment of objectives and functions as a management tool. Establishing the specifications requires careful consideration of many parameters. Voorn (*1*) has listed a number of determinants of product quality. Establishing specifications that reflect consumer acceptance and safety is quite straightforward. For example, measuring such parameters as microbiological populations, production composition, sensory parameters, shelf-life, and other product characteristics are routinely conducted by many processing operations. However, establishing specifications that reflect economies of operation requires

unconventional thinking. One approach is to determine the "cost of quality." Crosby (*2*) and Juran (*3*) relate the "cost of quality" to appraisal, prevention and failure costs. Prevention and appraisal are normal QC/QA costs. Failure costs (process or product failure costs) are the costs of non-conformance or the cost of not doing things correct the first time. In a properly operating QMS, parameters such as yield, product shrink, down time, credits, recalls, product scrap, consumer affair costs, and other product or process failure costs or non-conformance costs must be considered in specifications. Production of products that conform to established specifications will facilitate improved profits through reduced process on product failure costs.

In summary, Figure 1 illustrates the functions of a Quality Management System. The QMS combines quality control and quality assurance efforts with production and management activities to achieve product quality and improved profits. The QMS defines quality as conformance to specification. Specifications must reflect product safety, consumer acceptance, and economies of operation. A QMS focuses on improved quality which results in reduced costs leading to improved profits. Regulatory compliance and competitive advantages are spin-off benefits of a QMS.

Figure 1

(1) Voorn, R. J. (1982). A marketing perspective of dairy product quality. Dairy and Food Sanitation, 2:268-273.
(2) Crosby, Philip, B., (1979), *Quality is Free*, New American Library, Inc., N.Y.
(3) Juran, J. M., (1974), *Quality Control Handbook*, Third Edition, McGraw-Hill Book Company, N.Y.

Next month's *Dairy Quality* will discuss planning and organizing a Quality Management System.

PRESIDENTIAL ADDRESS

From the 72nd Annual Meeting
International Association of Milk, Food & Environmental Sanitarians, Inc.
Nashville, Tennessee

Archie C. Holliday

VA Dept. of Agriculture
1100 Bank St., Room 511
Richmond, VA 23219

Welcome to the 72nd Annual Meeting of the International Association of Milk, Food & Environmental Sanitarians. Here we are in Nashville, the Music Capital of the U.S.A! A number of you - 166 to be exact - were able to enjoy the "Grand Ole Opry" Saturday night. I hope that each of you will be able to find time to enjoy some of the other unique activities available in the Nashville area during your stay here. I am sure you are finding that it is a pleasure to be the guests of our Tennessee affiliate, one of our newer affiliates. This is the first time they have hosted an annual meeting so I know this is an exciting time for them!

Your annual meeting program committee, under the very capable leadership of Sid Barnard, has developed a program that is perhaps the most comprehensive we have ever had. It has not been easy and Sid is to be commended for his hard work in putting it together. Ruth Fuqua and her Tennessee Local Arrangements Committee are also to be commended for the many hours spent and sacrifices made to prepare for our comfort and entertainment. I want to acknowledge the fine work of my old friend, Cecil White, who has seen to it that the financial support, so vital to the smooth running of a conference of this magnitude, has been made available by our sponsors and contributors. I invite each of you to take the time to express your thanks to these people as the opportunity arises during the remainder of our meeting.

Now I would like to say a few words about the operation of your Association during the past year.

THE IAMFES OFFICE AT AMES, IOWA

Some of you may not be aware that Kathy Hathaway, our Executive Manager, is not with us at this meeting. Kathy was recently hospitalized for surgery and although she is doing well and recuperating at home, her doctor advised her not to travel for the next several weeks. I assure you that she really wanted to be here. In fact, when I talked to her last Thursday, I had to put my foot down and tell her she had better obey her doctor's orders. Suzanne Trcka is here in Kathy's place. Kathy and Suzanne were able to prepare for these unusual circumstances and Suzanne is doing a very good job of filling in for Kathy.

In May the staff in Ames moved into new office facilities. The office space is now slightly larger but the rent is $3.00 *less* per square foot of office space. Also, the office is all on the ground floor and there is a covered area for unloading materials received on trucks. At the time of the move the telephone system was changed from a two line to a four line system.

MEMBERSHIP

During this year a major revision in dues structure was implemented. I believe the Board feels that our dues arrangement is now where it should be. Kathy says that the loss of membership associated with the dues increase is much less than she anticipated. A membership drive operated from January to June produced a total of 21 new members. By the way - the membership drive winner is Larry Hemingsen of Minnesota. Larry brought in 6 new members and will receive $10 off his 1986 membership.

Yet our membership declined about 42 members to a total of 3,359. We had a similar decline last year. Saturday your Board took some action which should help turn around this downward trend. I'll talk about that a bit later. We all need to be working on increasing our membership.

PUBLICATIONS

Both the *Journal of Food Protection* and *Dairy and Food Sanitation* continue as sound, well respected publications. Henry Atherton has become Technical Editor of *Dairy and Food Sanitation*. The *Journal* Editor, Elmer Marth reports that there are enough articles on hand awaiting publication to provide for 6 or 7 issues. He indicates that this backlog is quite acceptable. However, this is not the situation with *Dairy and Food Sanitation* where there is almost no backlog of papers awaiting publication. This means that we need papers!! I earnestly encourage each of you to consider supplying information which you feel would be of interest to your fellow worker, to Kathy or Suzanne in Ames so that they can put it in *Dairy and Food Sanitation* for all of us to share.

FINANCES

Our financial situation continues to be sound. Our fund balance as reported by the auditor is a little over $40,000 dollars more than it was last year. This is due largely to a vigorous advertising sales campaign which yielded $50,000 dollars. Kathy has set her goal for advertising sales at $70,000 for next year. There is talk about establishing a working fund equivalent to one years operating expenses as a means of providing stability and sound management for our Association's finances. While the Board has taken no action on this issue at this time, it may decide in favor of an approach of this nature in the near future.

Speaking of the future, I believe our Organization is in a position to take care of its needs and to look toward providing new and improved services without continually seeking support by assessment of the membership. My belief is supported by the fact that we are becoming involved in new revenue producing ventures. One I have already mentioned. Advertising! Kathy says it is there and there is *every* reason for us to go for it! Another is exhibits at our annual meeting. Last year the Board authorized Kathy to plan the sale of space for 25 exhibits at next years meeting in Minneapolis. This is to be a pilot program which will be evaluated before continuing. I contacted our Sustaining Members seeking their advice on this endeavor. Over half of them replied and they all thought it was a good idea. Thirteen spaces have already been sold and we estimate that the remaining twelve will be sold shortly.

Yet another venture is designed to increase membership and thereby increase revenue. The details of a membership drive which will provide a grand prize of free air transportation, free registration and social events and a plaque to be presented at the annual meeting in Minneapolis to the member who brings in 30 new members next year, are to be published shortly. There are prizes also for recruiting 20, 10 and 5 new members. We are looking at some other ventures which have revenue producing capability but it is perhaps a bit too early to talk about them at this time.

In closing, I want to say that I've always considered with pride my opportunity to be a member of this fine organization. It has given Evalyn and I the chance to make many cherished friendships. That alone is priceless. Being able to associate and interact with members of International has strengthened my sense of professionalism. I am indeed grateful for the opportunity to serve in the offices of this organization. President-Elect, Sid Barnard follows me. I know that you will support him as you have me. Thank-you.

Past President, Archie C. Holliday (left) and President, Sidney Barnard (right).

72nd Annual Meeting Report

The 72nd Annual Meeting was held August 4-8, 1985 at the Hyatt Regency, Nashville, Tennessee.

The entire Local Arrangements Committee, chaired by Ruth Fuqua and Co-Chairperson Kenneth Whaley, is to be congratulated, along with...Facilities Chairperson, Harold Rose; Registration Chairperson, Herbert Holt; Finance Chairperson, Cecil White; Social Program Chairperson, Emily McKnight; and Partner Program Co-Chairpersons, Sara Whaley and Sybil White. Thank you also to Dietrich Wolframm for the photographs included with this report.

Saturday night pre-meeting entertainment was an evening at the Grand Old Opry. The Monday night entertainment was a Tennessee Hoedown, the group took buses to a location outside of Nashville for food, music, dancing and fun.

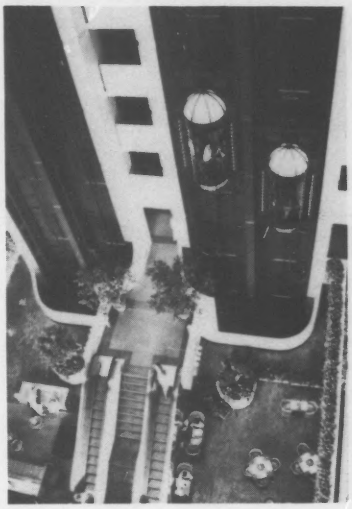
Partner activities included a Fall Fashion Show, a tour of Music Row, Southern Cooking School, a Cosmetic Makeover Clinic and a shopping trip to the Brandywood Shopping Mall.

The Annual Awards Banquet provided a great meal and entertainment by "Smoky Mountain Sunshine".

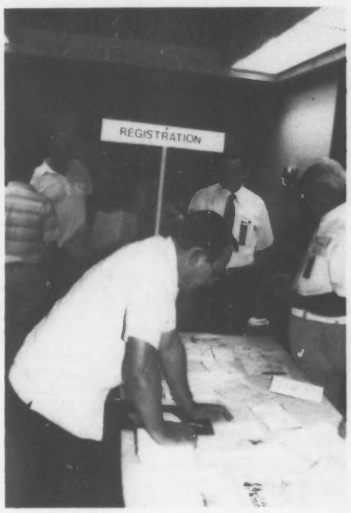
The 73rd Annual Meeting will be held August 3-7, 1986 at the Radisson South, Minneapolis, Minnesota. Co-Chairpersons for the 73rd Annual Meeting are Bill Coleman and Mike Pullen.

Be sure to nominate deserving colleagues for the prestigious IAMFES Awards this year. Information on nominating may be obtained from the IAMFES office in Ames.

A detailed account of the 72nd Annual Meeting follows...



Hyatt Regency Hotel - Nashville



Registration

Session

Committee on Communicable Diseases Affecting Man

Executive Board Meeting

Session

IAMFES Executive Board - front row, l to r, Dr. A. Richard Brazis, Archie Holliday, Sid Barnard. Back row, l to r, Roy Ginn, Leon Townsend, IAMFES representative Suzanne Trcka, Dr. Robert Marshall. Not pictured Helene Uhlman, Dr. Robert Gravani.

The Executive Board of IAMFES met at the Hyatt Regency, Nashville, Tennessee, August 3-8, 1985.

President Holliday called the meeting to order at 1:15 p.m. on Saturday, August 3. Board members present were Archie Holliday, Sid Barnard, Roy Ginn, Leon Townsend, A. Richard Brazis, Robert Marshall and Helene Uhlman. Others attending were Suzanne Trcka and Elmer Marth. Holliday informed the Board that Suzanne Trcka would be representing the Ames Office in the absence of Kathy Hathaway, Executive Manager, due to illness.

The Local Arrangements Committee Report given by Ruth Fuqua and Cecil White, indicated 302, plus speakers, were preregistered. Over $4,500 was received in donations.

Trcka reviewed the audit report for fiscal year 84-85. It was noted that there was an increase in working capital of $41,009. Marth suggested IAMFES continue to increase working capital to a minimum of 1 year's budget. A motion was made to accept the audit report. Motion passed.

Trcka gave the Executive Manager's report.

Board actions on specific parts of the Executive Manager's Report included:

1) For the Ames Office to prepare a total accountability of the advertising income and expenses in the future.

2) For Kathy to present, at the October meeting, a proposed retirement program. Ginn will submit the plan he follows and the ADSA plan.

3) Motion passed not to allow a "Members Only" membership.

4) A motion was made to approve the Membership Contest and add "should the winner be from the host state, travel to the next annual meeting will be paid". Motion passed.

Motion passed to accept the amended Executive Manager's Report.

Holliday reported that Wyoming submitted documents requesting a Charter. Motion passed to issue a Charter.

North Dakota also requested a Charter, but did not submit all of the necessary papers. A motion was passed, that providing that the necessary paperwork could be submitted prior to the Wednesday Banquet, the Charter was to be issued at that time.

Hermsen gave the Membership Report which indicates a loss of 66 members in 1985. Motion passed to accept the report.

Haverland gave the Foundation Fund Report. Recommendations included:

(1) Developing Scientist Awards.

(2) Guest Speaker for Annual Meeting.

Guidelines for the Developing Scientist Award:

1) Committee of 3 members be appointed to judge competition.

2) Criteria - the candidate must be a full-time graduate student enrolled in a Master or Ph.D. program. The paper and candidate must be recommended by their major professor. Abstracts of the paper must be received at the IAMFES office by January 1 of each year and the senior author must present the paper at the annual meeting. The presentation can be no longer than 20 minutes and may be supplemented with visual aids. Five Awards may be presented annually. First place $500 and plaque; Second $200; Third $100; Fourth $50 and Fifth $50. Awards will be given at the Awards Banquet. Nominating persons cannot serve on the judging committee. Program time will be allocated for competition. Program to be implemented in 1986. Total cost $925 per year.

Guidelines for the Guest Lecturer:

Criteria - Award be named after someone who has contributed substantially to the objectives of IAMFES. Lecturer be a recognized professional. Topic to be of interest to membership. Up to $500 be contributed from the Foundation Fund annually or travel expenses and $200 honorarium.

A motion was made to accept the recommendations with the following changes. Only 3 Developing Scientist Awards are to be given annually with the award of $500 plus plaque, $300 and $100. Motion passed. Barnard appointed Townsend to replace Ginn on the Foundation Fund Committee for 1986. The committee was asked to develop by-laws.

The budget report was discussed and revised for Fiscal Year 1985-86 showing Income over Expenses of $39,650. A motion was made to accept the report. Motion passed.

President Holliday called the meeting to order at 1:15 p.m. on Sunday, August 4. All members included in the August 3 meeting were present.

The Board reviewed and revised the Shogren Award Application.

The Nominating Committee, chaired by Bill Arledge, reported that no nominations had been made because of the new constitution reducing the number of officers. Barnard appointed the 1986 Nominating Committee as follows: Bill Arledge, Chairperson, Erwin Gadd, Bill Kempa, Bill Coleman, David Fry, Floyd Bodyfelt and Steve Sims. The Nominating Committee shall select candidates from Industry for the Secretary in 1986.

The CEU Committee Report was presented by Brazis and a motion was passed to accept the report. The Professional and Educational Development Committee was assigned the responsibility of studying the cost/benefit of having a CEU program. Brazis, Uhlman and Haverland were asked to join this committee.

The responsibilites of the Executive Board as prepared by Brazis were discussed and a motion was passed to accept the report.

The Board briefly discussed Sustaining Memberships. Two were lost

from overseas this year. All were contacted by letter concerning the decision to allow display booths at the 1986 meeting. All 18-19 that responded were in favor and many wanted a booth.

The meeting was called to order at 8:00 a.m. on Monday, August 5. All members included in the August 3 meeting were present. The following Past Presidents were also present: Howard Hutchings, Bill Arledge, Ivan Parkin, Dick Whitehead, Earl Wright, Bill Kempa, Harold Thompson, Harry Haverland and David Fry.

Joe Miranda and Austin Olinger reviewed the preliminary arrangements for the 1987 IAMFES Annual Meeting in California. The Disneyland Hotel in Anaheim will be the host hotel with a flat room rate of $72.

David Myers made a bid for the 1988 Annual Meeting on behalf of the Wisconsin Affiliate. They proposed a meeting site of the Green Bay Area.

Vernal Packard and Bill Coleman reported on the 1986 meeting arrangements scheduled for August 3-7 at the Radisson South, Minneapolis. The room rate is $63 (flat rate) per night.

President Barnard called the meeting to order at 7:30 a.m. on Thursday, August 8. In addition to the Executive Board, Ruth Fuqua, Elmer Marth and Suzanne Trcka were present.

The Local Arrangements Committee Report was given by Ruth Fuqua. The total attendance, including partners, was 426, with an estimated net budget balance of $3,900.

A motion was passed to hold the fall board meeting at the Radisson South Hotel in Minneapolis, Minnesota, October 11-13, 1985, beginning at 1:00 p.m. Ginn was asked to make the hotel reservations. A motion passed for IAMFES to pay travel, hotel and food expenses for the full Board, plus the Chairperson of the Scientific Program Committee for the Fall Board Meeting. The travel expenses are to be paid at the rate of air fare or 20 cents per mile, whichever is less.

Barnard has appointed Robert Marshall to replace R. B. Read as Chairperson of the Journal Management Committee.

A motion was passed that the Ames office should send a representative to the DFISA Show and share the 3-A Booth.

Townsend expressed concern for the present procedure for election of the Affiliate Council Chairperson and Secretary, and the need for a Nomination Committee to select 2 candidates for consideration. Ginn suggested terms be for 2 years. Holliday suggested that this topic be on the fall meeting agenda.

Barnard stated that a decision on the 1988 meeting location will be delayed until the fall Board meeting.

James Kennedy

Journal of Food Protection
Management Committee

The committee met on August 4, 1985 and discussed possible changes to improve the *Journal*. Recommendations were made for consideration by the Executive Board and for implementation by the Editors.

Those recommendations made for the consideration of the Executive Board are: 1. To better assure the financial health of the *Journal* and the Association, that a renewed effort be made to attract more Sustaining Members.

2. That student members have an opportunity to choose whether they receive the *Journal of Food Protection* or *Dairy and Food Sanitation* and that the charge for membership and one journal be $14 per year.

3. That the Executive Board set aside funds that would assure that a full size *Journal of Food Protection* could be published in years when the Association is running at a deficit. This would assure that scientific papers would not have to be held back from publication because of a reduced *Journal* size.

Those recommendations that are to be implemented by the Editors:

1. That the list of members of the Food Microbiology Division of the American Society for Microbiology and the Institute for Food Technology be reviewed to obtain a list of people who are not members of the Association. Further, that those that are not members be sent a copy of the *Journal* along with (1) an invitation to join and (2) in case they decide not to join, a check list to complete to indicate why they decided not to join.

2. That each *Journal* article carry as a footnote on the first page a list of uncommon abbreviations used in the article.

3. That the section in the *Journal* on Foodborne illness be expanded to contain selected articles from the United Kingdom, Wisconsin, California and others as appropriate.

4. That the dates of when a scientific paper is revised and when it is accepted be added to the date when it was received.

Respectfully submitted,
R. B. Read, Jr.
Chairperson

Dairy and Food Sanitation
Management Committee

The publication committee made the following recommendations:

1. That the Ames office provide a status update to all committee members as to the availability of articles for publication.

2. That affiliates be encouraged to

submit articles presented at their state meetings.

3. That consideration be given to using students in schools of journalism to review taped presentations on subjects presented on milk, food and environmental matters. These reviews could then be subjected to review for publication in *DFS*.

4. Establish a process whereby students in the fields of milk, food and environmental studies could submit articles to be used in competition. This idea carries with it a request to the Executive Board that they consider a cash award, free organizational membership or complimentary trip to an international meeting where the article could be presented by its author.

Respectfully submitted,
Harold Bengsch
Chairperson

Helene Uhlman, Affiliate Council Chairperson

Affiliate Council Report

Chairperson, Helene Uhlman, called the meeting to order at 10:00 a.m. on August 5, 1985. She opened the meeting with a request for all affiliate delegates present to participate in the meeting process.

Affiliate Secretary, Clem Honor, Illinois, called the roll of affiliate members. Nineteen affiliate delegates were present. Delegates from Connecticut, Iowa, Kansas, Michigan, Mississippi, Oregon, and South Dakota were absent. Executive Board members present were, Archie Holliday, Richard Brazis, Robert Marshall, Sidney Barnard, Roy Ginn, and Leon Townsend. Previous IAMFES past presidents present included: Howard Hutchings, David Fry, Earl Wright and Bill Kempa. Suzanne Trcka represented Kathy Hathaway, who was unable to attend. Including guests, 37 persons were in attendance.

Minutes of the previous Affiliate Council meeting held in Edmonton, Alberta, Canada were read by the Secretary. A motion to accept the readings was passed.

Letters from Lloyd Luedecke, Washington and David Bandler, New York were read by the Secretary.

Uhlman then called on Suzanne Trcka for comments from the Executive Manager, Kathy Hathaway.

Uhlman then challenged all delegates to participate in the IAMFES award program, especially the Shogren Award and the Certificate of Merit. Discussion followed with David Fry, Florida, suggesting that many don't understand the application form. Gerald Hein, Texas, suggested that an award packet be sent to each affiliate following the IAMFES meeting. Bill Coleman suggested emphasis from the IAMFES publications.

President Holliday emphasized IAMFES dependance upon the Affiliates, listing the following points:

1) Continuing education units (CEU's). He stated that the Executive Board was interested in CEU's but concerned with the lack of CEU uniformity between states.

2) Membership. He asked for Affiliate help to reverse the IAMFES membership decline, and introduced a program awarding any IAMFES member paid travel expenses to the 1986 meeting for signing 30 new members before the 1986 meeting, with lesser awards for members signing 20, 10 and 5 new members during the same period.

3) Announced a plan to simplify the IAMFES Award applications forms.

4) Emphasized the need for more news of meetings and other activities from the Affiliates to be sent to the Ames office.

There was additional discussion on CEU's. Harry Haverland, Ohio, said CEU's were essential in maintaining a sanitarian's registration. Erwin Gadd, Missouri, stated that Missouri's CEU program has helped maintain their Affiliate membership.

It was moved for IAMFES to establish a uniform CEU program for all Affiliates. Motion passed.

The delegate from the new Wyoming affiliate, Sandra Knop, was introduced. Also discussed was that North Dakota was near to being chartered.

Uhlman called upon Bill Coleman for information on the 1986 Annual Meeting in Minnesota.

Nominations for the 1985-86 Chairperson and Secretary were taken from the floor. Delegate Honer nominated Helene Uhlman for another term. Gerald Farst moved that the nominations be closed and that Uhlman be accepted by acclamation. Motion passed.

David Fry nominated Clem Honer for another term as Affiliate Secretary. Bill Coleman moved that the nomination be closed and that a unanimous ballot be cast. Motion passed.

Uhlman called for problems from the delegates. Discussion folowed regarding application forms, hotel reservations, and directions regarding future annual meetings.

There was a motion for adjournment. Motion passed.

Respectfully submitted,
Clem Honer
Affiliate Secretary

Henry Atherton, Dairy and Food Sanitation Technical Editor

Kirmon Smith

IAMFES Advisory Committee on Annual Meeting Program Content

The Committee met on August 5, 1985 from 8:00 to 9:50 a.m.

Individuals present were John Bruhn, Lloyd Bullerman, Jean-Yves D'Aoust, Michael Doyle, Joseph Frank, Elmer Marth, Ralston Read and John Silliker. Committee Chairperson Nelson Cox was unable to attend and asked Doyle to chair the meeting in his absence.

The Committee made the following recommendations:

1) Recipients of the annual IAMFES Educator and Sanitarian Awards be encouraged to present a general interest lecture in their area of expertise at the IAMFES Annual Meeting. The award recipients should be selected by March to April to accomodate the needs of the Program Committee which must know the speakers' names and topics by April so this information can be published as part of the program in the May issue of *JFP* and *DFS*.

2) At least one of the Cracker Barrel Sessions scheduled for Tuesday evening should be completely unstructured, i.e., no title or specific topics should be assigned. A panel of three to five individuals should be identified and a moderator should be selected to stimulate discussion among the audience and panel members.

3) The titles traditionally used to denote the scientific sessions (i.e., "Food Sanitation Session" and "Milk Sanitation Session") are often inappropriate because they inaccurately describe the content of the session. Examples of titles that may be more appropriate, depending on the content of the session are "Milk and Dairy Food Quality Session", "Milk Safety Session", or "Food Safety Session". Perhaps the title of each session could be selected on the basis of the content of the topics presented.

4) The Program Committee should carefully scrutinize abstracts of submitted papers and screen out those presentations that may be blatant advertising.

5) The Executive Board's action to provide graduate student awards for presentations made at the IAMFES Annual Meeting is indeed commendable. For this program to be successful, it is important that the availability of these awards be well publicized. In addition to publishing the criteria for eligibility in the appropriate journals, it would be beneficial to provide this information by letter to appropriate departments at universities throughout the U.S. and Canada.

6) In response to the Executive Board's request for suggestions to name the Foundation Fund-sponsored lectureship, two names were proposed. These were C.K. Johns and K.G. Weckel. Perhaps the two names could be combined resulting in the Weckel-Johns Lecture. Possible speakers for next year's lectureship include: E.M. Foster, J.C. Olson, B. Schweigert, David Clark, Harry Mussman, Peter Barton Hutt, J.C.M. Sharpe, Douglas Archer, Elizabeth Whealan and Frederick Stare.

7) The Program Committee might consider organizing a workshop to be held immediately before or after the Annual Meeting. The workshops might address proper inspection of a dairy plant, restaurant or food processing equipment.

8) At least two symposia on timely topics should again be presented at next year's Annual Meeting. To best accommodate the time needed to present these symposia, the same format that was used for this year's Annual Meeting should be used, i.e., IAMFES committee meetings should be held on Sunday afternoon and Monday morning before the Annual Meeting, and the Presidential Address and Business Session should be held Monday afternoon or evening. This would then leave all day Tuesday and Wednesday available for the presentation of research and general interest papers. A symposium should be presented Wednesday morning in lieu of the general session traditionally held. Suggested topics of symposia for the 1986 Annual Meeting include:

a) Economics and Incidence of Foodborne Outbreaks

b) What has been learned from problem experiences in the dairy industry and where do we go from here?

c) Water quality in food processing

d) Disinfectants and sanitizers

e) Biotechnology - a primer; basic techniques, application, and impact on environment

f) Packaging of foods; new processes, new materials, safety

g) Lactic acid bacteria; Technological innovations in dairy starter cultures, effect of lactics on health, implications of biotechnology, competitive growth (spoilage and food safety prevention), and fermented fluid milk

9) Expenses of the Chairperson of the Advisory Committee on Annual Meeting Program Content incurred to attend the fall Program Committee meeting should be paid by the IAMFES (perhaps from the Annual Meeting budget).

10) Before publication in IAMFES journals, galley proofs of the Annual Meeting Program should be reviewed by one of the editors of the *Journal of Food Protection*.

Respectfully submitted,
Michael P. Doyle
Acting Chairperson

BISCC Committee

In 1949, six intra-industry organi-

zations founded the Baking Industry Sanitation Standards Committee (BISSC) to formulate construction standards for bakery equipment in an effort to eliminate major sanitation problems attributed to improper design.

In addition to industry support, BISSC sought advisory assistance from public health agencies and associations.

The IAMFES and other health related associations joined BISSC with the ultimate goal that all BISSC standards would be formulated to insure that all parts of bakery equipment would be readily accessible for easy and thorough cleaning by regular employees using ordinary cleaning methods.

From the very inception of BISSC, the IAMFES has participated in all BISSC meetings including the 70th meeting held in 1985.

At the Winter Meeting in Chicago on March 1, 1985, the IAMFES was represented by the BISSC Committee Chairman who served on several Task Committees and as a member of the Office of Certification.

The Task Committees engaged in updating and clarifying existing standards #1, #27, and #28.

After agreeing to some minor changes, the general BISSC Committee recommended that both of the standards reviewed be adopted by the BISSC Board of Directors.

At present, there are BISSC Standards covering forty-two categories of baking equipment with seventy-seven registrations and one hundred seventy-two authorizations for equipment manufactured in compliance with the Standards.

A BISSC slide presentation, originally shown at the Bakery Expo '81 has been updated and is now available, without charge, to members of IAMFES upon request from: Mr. Raymond J. Walter, Executive Secretary, BISSC, Lincoln Building, Suite 858, 60 East 42nd Street, New York, NY 10017.

All BISSC information booklets as well as all BISSC Standards are also available from the Executive Secretary. Sanitarians and members of IAMFES are urged to aquire a set of these Standards and adopt them as guidelines and subscribe to the principles by the BISSC Standards and Criteria.

The 1986 BISSC meeting will be held in Chicago, Illinois in March. The exact date will be published in all the major Trade Journals later this year. The BISSC Committee of the IAMFES encourages all members to attend the 1986 BISSC Meeting in Chicago.

Respectfully submitted,
Martyn A. Ronge
Chairperson

John Silliker

Foundation Fund Committee Developing Scientist Award Criteria

The Executive Board of the International Association of Milk, Food and Environmental Sanitarians, Inc., (IAMFES) has instituted a Developing Scientist Awards Program beginning in 1986.

PURPOSE:

To support and encourage individuals doing graduate work

To increase graduate students professionalism through contact with their peers and other professionals

To increase graduate students participation in professional organizations

CRITERIA

1) Candidate must be a full-time graduate student enrolled in a Master or Ph.D. program at an accredited College/University. Candidate cannot have graduated more than one (1) year prior to the deadline for submitting abstract.

2) Paper and candidate must be recommended for the competition by their major professor.

3) Abstract of the paper and recommendation must be received at the IAMFES Office, Ames, Iowa, by January 1 of each year.

4) The senior author must present the paper at the Annual Meeting.

5) Presentation cannot be longer than twenty (20) minutes.

6) Presentation may be supplemented with visual aids.

7) Three (3) Awards may be presented: 1st $500 and a plaque; 2nd $300; and 3rd $100.

8) Awards will be presented at the IAMFES Annual Awards Banquet.

9) Nominating/recommending person cannot serve on the Committee judging the competition.

(see p. 442 for the entire Foundation Fund report.)

Respectfully submitted,
Harry Haverland
Chairperson

Farm Methods Committee

3-A Sanitary Standards Symbol Administrative Council

At the October 16, 1984 meeting of the Council in San Francisco, Robert E. Holtgrieve was welcomed as a new Trustee. He earlier had been appointed to the Council as representative of the IAMFES, replacing Orlowe M. Osten, who resigned for health considerations. At the meeting, Holtgrieve was elected Secretary-Treasurer of the Council and Earl O. Wright was elected Assistant Secretary-Treasurer.

Also at this meeting Pat J. Dolan was presented with a plaque recog-

Ruth Fuqua, Local Arrangements Chairperson

Ivan Parkin, Parlimentarian

Sid Barnard, 1985-1986 IAMFES President

nizing his service to the Council. Mr. Orlowe M. Osten had been presented with a similar plaque this past September at his home.

There were only two non-compliance complaints since the IAMFES meeting last August. Both were resolved to the satisfaction of the Council and sanitarians by the manufacturer of the equipment in question.

There were five authorizations dropped since August of 1984 and thirteen new ones, making a total of 255 active authorizations. This list was sent to Ames, Iowa in June, 1985 and should be published in September, and distributed shortly thereafter.

There were four new revisions of standards authorized for signing at the May, 1985 Meeting of the 3-A Sanitary Standards Committees in Milwaukee, Wisconsin. There were also three tentative revisions and one tentative accepted practice returned to task committees for further action.

Referring to the complex 3-A fitting standards, the steering committee acting for the 3-A Sanitary Standards Committees approved individual standards for fittings, individual valves, automatic samplers, and rupture discs, now appearing in Part I of the 3-A Sanitary Standards for Fittings 08-17. These new standards will be prepared for printing by the International and a notice will appear in *Dairy and Food Sanitation* when copies are available.

The next 3-A Symbol Council Meeting will be held in October, 1985 during the DFISA Show in Atlanta.

The current Symbol Council Trustees are: Dr. Warren S. Clark, Chairman; Carl F. Nielsen, Vice Chairman; Robert E. Holtgrieve, Secretary-Treasurer; Earl O. Wright, Assistant Secretary-Treasurer; Dr. Henry V. Atherton; Dr. A. Richard Brazis; David D. Fry; and Robert L. Nissen.

Respectfully submitted,
Robert E. Holtgrieve
Secretary-Treasurer

Committee on Food Equipment Sanitary Standards

The IAMFES Committee on Food Equipment Sanitary Standards, known hereafter as "the Committee," is charged with the responsibility of carrying out the following objectives:

1. To cooperate with other interested health and regulatory organizations and food-related industries in the formulation of sanitary standards and educational materials for the fabrication, installation, and operation of food equipment and food vending machines.

2. To provide advice to the food and vending industry in improving the design, construction and installation of food equipment so that the equipment will be easy to clean and will function properly when placed into service.

3. To cooperate with the food industry in the preparation of standards or guidelines which are acceptable to both the food industry and to regulatory/public health agencies, thereby securing uniform quality and nationwide acceptance of such equipment.

4. To present to the IAMFES membership those standards and educational materials which the Committee recommends be endorsed by the Association.

The Committee reported the action, or proposed action, taken during the past year by the two health and industry organizations with which the Committee interacts: the National Sanitation Foundation's Joint Committee on Food Equipment Standards, and the National Automatic Merchandising Association's Automatic Merchandising Health Industry Council (AMHIC).

The following recommendations have been made by the IAMFES Committee on Food Equipment Sanitary Standards:

1. That the International Association of Milk, Food and Environmental Sanitarians reaffirm its support of

the National Sanitation Foundation and the National Automatic Merchandising Association and continue to work with these two organizations in developing acceptable standards and educational materials for the food industry and for the public health sector.

2. That the Association urge all sanitarians to obtain a complete set of the National Sanitation Foundation's Food Equipment Standards and Criteria; a copy of the National Automatic Merchandising Association/Automatic Merchandising Health Industry Council's Vending Machine Evaluation Manual; a copy of the Food Service Equipment and Vending Machine listing and related educational materials, so as to evaluate each piece of food equipment and each vending machine in the field to determine compliance with the applicable sanitation guidelines (construction and installation specifications), and to let this Committee and the appropriate evaluation agency know of any listed manufacturer or fabricator failing to comply with any of these guidelines.

3. That the Association urge all sanitarians and regulatory agencies to suppport the work of the Committee; to submit suggestions for developing new guidelines and for amending same; and to subscribe, by law or administrative policy, to the principles represented by the Standards, Criteria, and Evaluation Manual for food equipment and vending machines.

Respectfully submitted:
Karl K. Jones
Chairperson

International Dairy Federation Committee

Following is a condensed report of the IAMFES International Dairy Federation Committee from August 1984 to July 1985. It is divided into two sections, one covering the Annual Sessions of the International Dairy Federation at Prague, Czechoslovakia and the other the activities of the USA National Committee for IDF (USNAC) for the same period.

USNAC Report to Members of the 48th Annual Sessions of the International Dairy Federation, Prague, Czechoslovakia, September 17-21, 1984:

The IDF Annual Sessions are divided into six IDF Commissions, each covering a specific aspect of the dairy industry. These Commissions are:

A - Production, Hygiene and Quality of Milk
B - Technology and Engineering
C - Economics, Marketing and Management
D - Legislation, Compositional Standards, Classification, Terminology
E - Analytical Standards, Laboratory Techniques
F - Science and Education

Fourteen delegates from the USA attended the Annual Sessions and those with special expertise were assigned to particular Commissions. Further information can be found in the complete report which has been submitted to the IAMFES Board.

Minutes of the USNAC 5th Annual Meeting:

The USNAC meeting was held on April 25, 1985 in Rosemont, Illinois. Membership has dropped from 44 in 1984 to 40. This is due to six members not renewing and two new members being added. Membership brochures were distributed at the ADSA meeting on June 11, during the IDF Seminar, at the IAMFES Annual Meeting in August and will be distributed at the USNAC/IDF booth in Atlanta during the DFISA Expo.

The final program for the seminar "New Dairy Products via New Technology" to be held October 8-9, 1985, during the DFISA Expo, was presented and all speakers have been committed. (This program was published in the September issue of *Dairy and Food Sanitation*).

Respectfully submitted,
Harold Wainess
IAMFES Representative to the IDF

Thanks to the 72nd Annual Meeting Local Arrangements Committee - It was an Outstanding Meeting.

IAMFES Secretary Report

The Annual Business Meeting of the International Association of Milk, Food and Environmental Sanitarians, Inc. was held Monday, August 5, 1985 at the Hyatt Regency, Nashville, Tennessee.

President Archie Holliday called the meeting to order at 2:50 p.m.

Minutes of the 1984 meeting were read by Second Vice President Leon Townsend substituting for Robert Gravani. Motion to accept the minutes as read by Townsend, Second by Whitehead, Motion passed.

The Executive Secretary's report was given by Suzanne Trcka, substituting for Executive Manager, Kathy Hathaway, who is recuperating from surgery. Highlights of the report included:

1. 1984-85 Net income over $40,000.
2. Ames office moved into larger office.
3. Fourth full-time office staff person added.
4. Advertising goal of $50,000 was met.
5. Advertising goal for 1985-86 is $70,000.
6. Exhibits will be utilized on a trial basis at the 1986 Annual Meeting in Minneapolis.
7. Membership will be the top priority this year.
8. A Past Presidents quarterly newsletter was begun in 1985.

Committee Reports given included:

Journal of Food Protection Management - Read

Dairy and Food Sanitation Management - Bengsch and Atherton

Foundation Fund - Haverland

Membership - Hermsen

Baking Industry - Brazis

Awards - Brazis

IDF/USNAC - Wainess

Joint Sanitarians Council - Sanders

Dairy Farm Methods - David

Sanitary Procedures - Whitehead

Communicable Diseases Affecting Man - Bryan

Scientifc Program Content - Doyle

Food Equipment Sanitary Standards - Jones

Applied Laboratory Methods - Case

3-A Symbol Council - Holtgrieve

The Affiliate Council report was given by Chairperson Helene Uhlman.

The Resolutions Committee report was given by Richard Brazis. Five resolutions were presented, four were approved for adoption by the Executive Board and one was not approved.

The following resolutions were approved for adoption by the Executive Board:

1) Expressed appreciation to the Tennessee Affiliate and the Local Arrangements Committee.

2) Expressed appreciation to the Hyatt Regency.

3) Requested FDA to proceed toward preventing shipment of raw milk in interstate commerce. Motion to adopt by Brazis, Second by Heady. Motion passed.

4) Requesting FDA to develop Operator Training for Retort and Pasteurizers. Motion to adopt Brazis, Second Atherton. After discussion, Motion to table Hern, Second Dorrah. Motion to table passed.

The following Resolution was not recommended for adoption by the Executive Board:

5) Instructed Executive Board to take necessary steps to change name of Association to Association for Food Protection. Motion Brazis to adopt, Second Bruhn. After discussion and upon standing vote, Motion failed (only 12 votes were in favor of adoption).

The Nomination Committee report was given by Bill Arledge, he stated that no nominations were needed this year due to the change in the Constitution to reduce the membership of the Executive Board.

The meeting adjourned at 4:15 p.m.

Respectfully submitted,
Leon Townsend
Second Vice President

RESOLUTION I.

WHEREAS:

The Tennessee Association of Milk, Water and Food Protection and their Local Arrangements Committee labored long and diligently, with exceptional success to host the Seventy-Second Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, in Nashville, Tennessee, and,

WHEREAS:

The facilities for both the technical sessions were anticipated and provided with the usual generosity and style by the Tennessee Association of Milk, Water and Food Protection and their Local Arrangements Committee, and,

WHEREAS:

These same hosts exercised the highest standards of the International Association of Milk, Food and Environmental Sanitarians, in coordinating the efforts of their industry, educational and governmental members toward the success of the association's annual meeting, and,

WHEREAS:

The 1985 meeting was in every respect "Par Excellence" that will long be remembered:

THEREFORE, BE IT RESOLVED:

That the International Association of Milk, Food and Environmental Sanitarians adopt this resolution of appreciation and gratitude toward the Tennessee Association of Milk, Water and Food Protection, and further, that a copy of this resolution be sent to the Tennessee Association of Milk, Water and Food Protection and be published as well in the official organ of the Association - *Dairy and Food Sanitation*.

RESOLUTION II.

WHEREAS:

The Hyatt Regency Hotel, Nashville, Tennessee, was the site of the 1985 International Association of Milk, Food and Environmental Sanitarians Seventy-Second Annual Meeting, and,

WHEREAS:

The personnel of the Hyatt Regency Hotel were most accomodating to the needs of the members, guests and their families of the International Association of Milk, Food and Environmental Sanitarians, and,

WHEREAS:

The facilities for the program ses-

sions and the members, guests and their families' personal comfort were outstanding:

THEREFORE, BE IT RESOLVED

That an appropriate expression of gratitude be sent to the management and staff of the Hyatt Regency Hotel.

RESOLUTION III.

WHEREAS:

Raw Milk is a food of animal origin, and

WHEREAS:

Food of animal origin sometimes contain pathogenic bacteria, and,

WHEREAS:

Such pathogenic bacteria specifically associated with raw milk include, but are not limited to *Salmonella* species, *Campylobacter jejuni, Listeria monocytogenes, Staphylococcus aureus,* and *Streptococcus agalactiae,* and,

WHEREAS:

In the United States of America and Canada, there continues to be outbreaks of human illness associated with the consumption of raw milk containing pathogenic bacteria,

NOW, THEREFORE BE IT RESOLVED,

That the International Association of Milk, Food and Environmental Sanitarians, Inc., in convention assembled, beseeches, implores, and petitions the Food and Drug Administration of the United States of America and the Health Protection Branch of Health and Welfare of Canada, immediately take steps needed to prohibit the sale of raw milk at the retail level in the United States of America, and in Canada, respectively.

BE IT FURTHER RESOLVED

That a copy of this resolution be forwarded by the President of the International Association of Milk, Food and Environmental Sanitarians, Inc., to the Food and Drug Administration of the United States of America, and to the Health Protection Branch of Health and Welfare, in Canada.

Respectfully submitted,
A. Richard Brazis, Chairman
Resolutions Committee

EARLY BIRD RECEPTION

SPOUSES PROGRAM

HOEDOWN

AWARDS BANQUET

IAMFES AWARDS

Sanitarians Distinguished Service Award To Harry Haverland

Harry Haverland (l) receives the Sanitarians Award from Maynard David (r) of Diversey-Wyandotte.

Harry Haverland was awarded the 1985 Sanitarians Award in recognition of his outstanding service to the profession of the Sanitarian. He received $1,000 and a plaque with this award.

Haverland started his career as a sanitarian with a city health department, carrying out milk and food sanitation, as well as general sanitation responsibilities. In 1960 he accepted a commission in the U.S. Public Health Service. Working seven years in regional offices in Dallas, Texas and Boston, Mass. gave Haverland an opportunity of working with state and local counterparts.

He was then promoted to acting chief of a regional environmental sanitation program. His next assignment was Chief, Food Hazards Surveillance Unit for the Food and Drug Administration. His first headquarters assignment (Washington, DC area) was to serve as Chief, Interstate Travel Sanitation for FDA.

He soon was made Deputy Director of the Division of Food Service and Milk Sanitation. In less than one year he assumed the directorship of the entire division. He worked very closely with the National Conference of Interstate Milk Shippers, and again with state and local regulatory agencies in carrying out a cooperative milk and food protection program.

In 1973 he became Director of the State Training Branch for FDA. Here his tremendous drive and ambition was evidenced in the way he carried out the goals of the State Training Branch. The Training Branch developed into an internationally-known group of training specialists. Many ideas were implemented and are still being used and followed today.

Haverland received three special promotions in the U.S. Public Health Service. A Public Health Service Commendation Medal, a Public Health Service Citation, and a Public Health Service Meritorious Service Medal. During his directorship of the training branch, FDA gave the entire branch a Unit Commendable Service Award.

1985 Harold Barnum Industry Award To William L. Arledge

John Meyer (l) of Nasco presenting the Harold Barnum Award to William L. Arledge (r).

William L. Arledge was this years recipient of the Harold Barnum Industry Award. He received $500 and a plaque for his outstanding contributions to industry and the International.

Arledge has been employed by Dairymen, Inc. in Louisville, Kentucky since 1968. He has been a member of IAMFES for 25 years and served as President 1980-81.

He has also been actively involved with the National Conference on Interstate Milk Shippers, the National Mastitis Council, the National Milk Producers Federation and Dairymen, Inc., where he updated and instituted a new QA program for Dairymen, to improve and strengthen the raw milk quality throughout the company.

There are few members who do not know of Bill Arledge's dedication to IAMFES. He is regarded in the dairy industry as a leader, who strives to improve sanitation and quality, which leads to improved consumer acceptance of the products.

His ability to work with people has been proven time and time again. IAMFES has gained affiliates and members, as well as esteem in the professional community because of his efforts.

Dr. Lloyd B. Bullerman Receives Educator Award

Dr. Lloyd Bullerman (center) receives the Educator Award from Joe Scolaro (l) and Larry Hemmingsen (r).

Dr. Lloyd B. Bullerman received $1,000 and a plaque for recognition of his leadership, scholarship and outstanding academic contributions to food safety and sanitation.

Dr. Bullerman is presently Professor in the Department of Food Science and Technology at the University of Nebraska. His research during the past sever years has been with molds and mycotoxins on dairy, meat and cereal products. Work has involved isolation and identification of mods common to cheese and cured meats, and evaluation of toxin production and potential health hazards associated with molds in these products.

Over 50 scientific papers in various scientific journals were contributed by Bullerman along with a chapter entitled "Methods for Detecting Mycotoxins in Food and Beverages" to the book *Food and Beverage Mycology,* and has published over 50 abstracts of papers presented at various scientific and professional meetings.

Bullerman has been responsible for teaching courses in Food Microbiology, Foodborne Infections and Intoxications (Foodborne Diseases), Food Toxicology, Advanced Food Microbiology, and Food Mycology. He has servced as an advisor to 10 to 12 undergraduate students annually in the College of Agriculture. During the alst seven years he has advised 14 graduate students (6 M.S. and 8 Ph.D.).

Overall, Dr. Bullerman's research has maintained a high level of productivity, visibility and recognition. Dr. Bullerman is a recognized leader on the importance of molds and mycotoxins in human foods from the standpoints of food safety, sanitation, science and technology.

Citation Award Presented To Ralston B. Read, Jr.

Ralston B. Read, Jr. was presented the 1985 Citation Award. Currently Dr. Read is Director, Division of Microbiology, Food and Drug Administration and is responsible for the research and operating activities of the Division of Microbiology; he is also Program Manager of the Natural Hazards Program of the Bureau of Foods.

Read, for more than 10 years, has served as Chairman of the Journal Management Committee (*Journal of Food Protection*). During this time, and in large measure through his leadership, the Committee recommended some major changes which have benefitted both the *Journal* and IAMFES. Some are: (a) Change in name of the *Journal* from *Journal of Milk and Food Technology* to *Journal of Food Protection*; (b) Development of *Dairy and Food Sanitation*; (c) Served as a member of the editorial board for the *Journal*; (d) He and his colleagues have submitted a number of papers to the *Journal* and (e) Dr. Read has not only regularly attended annual meetings of the IAMFES, but often has given invited presentations at the meetings.

Virtually all of Dr. Read's professional career has been and continues to be devoted to assuring a safe food supply for the U.S. consumer.

Citation Award Recipient Ralston B. Read, Jr.

Honorary Life Membership Presented To Three Members

Joe Cardoza (l) accepts for Patrick Dolan.

Dr. Elmer Marth (l) accepts for Dr. Franklin W. Barber.

Clarence Luchterhand (l) accepts award.

Patrick J. Dolan

Patrick Dolan joined the California State Bureau of Dairy Service as a Junior Dairy Inspector in 1942, advanced in rank to Market Milk Specialist, District Supervisor, and in 1966 was promoted to Regional Administrator, a position he held until his retirement in 1977.

He has been actively involved with the 3A Sanitary Standards Committee, the 3A Sanitary Standards Symbol Council, and has spent 25 years as Chairman of Sanitary Standards Committee in the California Association of Dairy and Milk Sanitarians (CADMS).

Dolan developed and improved one of the first HTST Testing Instruments presently in use in California and Nevada.

He has received various awards including the Dairy Industry Man of the Year at the California State University Dairy Club in 1975, the Certificate of Merit from IAMFES in 1978, Sanitarian of the Year award from CADMS in 1981, and a recognition plaque for his service to the 3-A Sanitary Standards Administrative Council in 1984.

Dr. Franklin W. Barber

Dr. Barber received his Ph.D. in 1944 from the University of Wisconsin in Madison. He retired from Kraft, Inc., Research and Development Laboratories in 1975 after 30 years of service.

Barber has been a member of IAMFES since 1944 and served as President in 1959. He was a member of the Laboratory Methods Committee in the early 1950's and was a member of the *Journal of Food Protection* Management Committee and Editorial Board. He joined the Florida Association of Milk, Food and Environmental Sanitarians in 1977 and became their Secretary-Treasurer in 1981, and continues to serve in that capacity today.

Clarence K. Luchterhand

Clarence Luchterhand, who retired in 1984 as Chief, Milk Certification Section of the Wisconsin Department of Health and Social Services, has been a long time member of IAMFES and the Wisconsin Association of Milk and Food Sanitarians.

He was a charter member of the National Conference on Interstate Milk Shippers and in 1974 was honored with the IAMFES Sanitarians Distinguished Service Award.

Arthur Freehling (r), President of the PDSA, accepts the Shogren Award from Helene Uhlman (l).

Pennsylvania Dairy Sanitarians Assn. Receives Shogren Award

The 1985 Shogren Award was presented to the Pennsylvania Dairy Sanitarians Association. This award is presented annually to an affiliate group of IAMFES who has done outstanding work for their afffiliate as well as IAMFES.

Audrey Hostetter-Throne (r) receives the Certificate of Merit.

Audrey Hostetter-Throne Receives 1985 Certificate Of Merit

The Certificate of Merit was presented to Audrey Hostetter-Throne of Hershey, Pennsylvania. She is the manager of Farm Operations for the Hershey Chocolate Company. This award is presented to those members who are active within their affiliate and international group.

Hostetter-Throne is currently a Pennsylvania approved Dairy Field Inspector and a member of the Southeastern Pennsylvania Approved Inspectors Association. She is actively involved with the Pennsylvania Dairy Sanitarians Association and is their Secretary-Treasurer.

Vay Rodman (r) accepts the Sherman Award from Paul Martin of NIFI (l). Not present was Harold K. Penninger.

1985 Sherman Award Presented For Foodservice Article

The 1985 Norbert F. Sherman Award was presented to Harold K. Penninger and Vay A. Rodman for their article "Foodservice Managerial Certification - How Effective Has It Been?" This article was published in the July 1984 issue of *Dairy and Food Sanitation*.

The Sherman Award is offered annually by NIFI, the foodservice industry's not-for-profit educational foundation, to provide recognition to articles that best reflect the principles of Norbert F. Sherman, late chief executive of North American Foodservice Companies, Inc., and former NIFI Treasurer.

Phil Park (r) receives Affiliate Charter from Affiliate Council Chairperson, Helene Uhlman (l).

IAMFES Affiliate Charter Presented To North Dakota

The North Dakota Environmental Health Association was presented with an Affiliate Charter during the Awards Banquet. They presented the IAMFES Board a list of 10 members common to both associations and requested for affiliate status.

Sandra Knop (l) receives Affiliate Charter from Affiliate Council Chairperson, Helene Uhlman (r).

IAMFES Affiliate Charter Presented To Wyoming

The Wyoming Public Health Sanitarians Association was also presented a Charter during the 1985 Awards Banquet. IAMFES is pleased to welcome them as an affiliate.

Harold Thompson (l) and Archie Holliday (r) present the "C-Flag".

3-A Committees Receive President's C-Flag

The President's Citation Program for Private Sector Initiatives recently honored the 3-A Sanitary Standards Committees with a C-flag, a symbol that indicates "We Can" and We Care."

One flag was presented to the IAMFES during the Annual Awards Banquet because of the IAMFES sponsoring role in the 3-A.

The 3-A Program was recognized for its unique nationwide industry - regulatory program of Sanitary Standards for equipment used in processing dairy foods.

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104	124	144	164	184	204	224	244	264	284	304	324	344
105	125	145	165	185	205	225	245	265	285	305	325	345
106	126	146	166	186	206	226	246	266	286	306	326	346
107	127	147	167	187	207	227	247	267	287	307	327	347
108	128	148	168	188	208	228	248	268	288	308	328	348
109	129	149	169	189	209	229	249	269	289	309	329	349
110	130	150	170	190	210	230	250	270	290	310	330	350
111	131	151	171	191	211	231	251	271	291	311	331	351
112	132	152	172	192	212	232	252	272	292	312	332	352
113	133	153	173	193	213	233	253	273	293	313	333	353
114	134	154	174	194	214	234	254	274	294	314	334	354
115	135	155	175	195	215	235	255	275	295	315	335	355
116	136	156	176	196	216	236	256	276	296	316	336	356
117	137	157	177	197	217	237	257	277	297	317	337	357
118	138	158	178	198	218	238	258	278	298	318	338	358
119	139	159	179	199	219	239	259	279	299	319	339	359
120	140	160	180	200	220	240	260	280	300	320	340	360

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Abstracts of papers in the November Journal of Food Protection

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

Microbial and Quality Assessment of Household Food Discards, Shirley J. Vanderiet and Margy J. Woodburn, Foods and Nutrition Department, Oregon State University, Corvallis, Oregon 97331

J. Food Prot. 48:924-931

Quality aspects and microbial counts of household food discards were determined. Samples were analyzed for total aerobic and anaerobic plate counts, total coliforms, *Staphylococcus aureus,* total anaerobes, *Clostridium perfringens,* and molds. The length of household storage time, the householder's reason for discard, the householder's safety assessment of the food and laboratory panel evaluations of off-odor, off-color and off-texture were compared to the laboratory microbial analyses. In 62% of the microbiologically analyzed foods, the householder did not make correct safety assessments. In 9% of the microbiologically analyzed foods, an assessment of safe was made by the householder for foods which wre determined to be at risk. Aerobic plate counts (APC) were made after incubation at 5, 20, and 35°C. Panel odor scores were more closely related to APC at 5°C than to those at 20 or 35°C.

Thermal Treatment of Cottage Cheese "In-Package" by Microwave Heating, Lisa M. Tochman, Charles M. Stine and Bruce R. Harte, School of Packaging, and Department of Food Science and Human Nutrition, Michigan State University, East Lansing, Michigan 48824-1223

J. Food Prot. 48:932-938

Small-curd cottage cheese was packaged in polystyrene tubs and subjected to heat treatments of 37 - 82.2°C using .5 and 2.8 kw microwave sources. Cottage cheese was also packed in flexible pouches (laminate structure of ethylene vinyl acetate/polyvinylidene chloride/ethylene vinyl acetate - EVA/PVDC/EVA) and polyethylene tubs and subjected to heat treatments of 37.0 - 82.2°C. Moisture content, syneresis, microbial population, pH and sensory properties were monitored until samples were considered no longer acceptable. The shelf life of samples ranged from 7 to 42 d. Optimum quality was observed when the packaged cheese was heated to 48.8°C using the low power source. Cheese packed in the flexible pouches had the longest shelf life.

Reduction of *Salmonella* on Chicken Carcasses by Immersion Treatments, G. J. Morrison and G. H. Fleet, School of Food Technology, The University of New South Wales, P.O. Box 1, Kensington, New South Wales, Australia 2033

J. Food Prot. 48:939-943

Using a tracer strain of *Salmonella typhimurium* and a direct-counting technique, a procedure was developed for evaluating the effect of immersion treatments on the *Salmonella* contamination of chicken carcasses. Immersion of carcasses in 60°C water for 10 min gave 100-fold reduction in *Salmonella* counts. Addition of 200 ppm chlorine or 2.5% potassium sorbate to the water increased the reductions to 1000-fold with elimination of *Salmonella* from most carcasses. Other immersion treatments were not as effective. Sensory evaluation indicated the acceptability of treated carcasses on the basis of appearance and flavour.

Factors Affecting Survival of *Campylobacter jejuni* on Experimentally Inoculated Pork Skin Stored Under Various Conditions, A. J. Bracewell, J. O. Reagan, J. A. Carpenter and L. C. Blankenship, Food Science Department, University of Georgia, Athens, Georgia 30602 and Richard B. Russell Agricultural Research Center, United States Department of Agriculture, Science and Education Administration, Agricultural Research Service, P.O. Box 5677, Athens, Georgia 30604

J. Food Prot. 48:944-946

Pork skin inoculated with a nalidixic acid-resistant strain of *Campylobacter jejuni* was subjected to three treatments to determine the effect of storage temperature, oxygen concentration, and drying on survival of the organism. Survival rate was determined for each treatment by enumeration over a 48-h period on Brucella agar containing nalidixic acid. Of the treatments studied, chilling with forced ventilation and storage at 20°C caused significant reductions in numbers of survivors. The results of this study confirm reports by other investigators that conventional forced ventilation chilling of pork carcasses has the beneficial effect of reducing skin surface *Campylobacter* contaminants.

***Yersinia enterocolitica:* Survival of a Pathogenic Strain on Milk Containers,** John T. Stanfield, George J. Jackson and C. C. G. Aulisio, Division of Microbiology, Food and Drug Administration, Washington, D.C. 20204

J. Food Prot. 48:947-948

A strain of *Yersinia enterocolitica* isolated from a patient in a milk-associated yersiniosis outbreak in Tennessee, Mississippi and Arkansas in the summer of 1982 was used to contaminate the exterior of refrigerated milk containers. The bacteria survived on the containers for as long as 21 d, as shown by recovery on MacConkey agar plates or in veal infusion broth. *Y. enterocolitica* was not detected in milk poured from the contaminated containers.

Evaluation of the Antibotulinal Effectiveness of Nisin in Bacon, Steve L. Taylor and Eileen B. Somers, Food Research Institute, Department of Food Microbiology and Toxicology, and Department of Food Science, University of Wisconsin, Madison, Wisconsin 53706

J. Food Prot. 48:949-952

Nisin in combination with nitrite is an effective antibotulinal treatment for bacon. However, rather high levels of nisin (100 to 150 ppm) are required in combination with 120 ppm nitrite to provide a brief, 1-wk extension of shelf life for inoculated bacon incubated at 27°C. This limited antibotulinal effectiveness of nisin in bacon would have little practical value. The limited antibotulinal effectiveness of nisin in bacon was attributed to its insolubility in pickle solutions and its likely slow and incomplete diffusion from the pickle solutions into pork belly tissue.

Immunization of Swine for Production of Antibody Against Zearalenone, J. J. Pestka, M-T Liu, B. K. Knudson and M. G. Hogberg, Department of Food Science and Human Nutrition and Department of Animal Science, Michigan State University, East Lansing, Michigan 48824-1224

J. Food Prot. 48:953-957

Production of antisera specific for zearalenone was investigated in swine for potential use in prophylaxis against zearalenone hyperestrogenism. Swine were immunized with zearalenone-6′-carboxymethyloxime bovine serum albumin conjugate by four different protocols. For detection of anti-zearalenone antibody, a simple indirect enzyme-linked immunosorbent assay (ELISA) was devised whereby porcine antiserum was incubated over a zearalenone-6′-carboxymethyloxime poly-L-lysine solid phase and total bound antibodies were detected with peroxidase-labeled anti-swine serum. The optimal immunization protocol consisted of an initial injection of 5 mg of conjugate followed by a 2-mg boost at 4 wk and was sufficient to obtain anti-zearalenone titers of 1:5120 in 8 wk. Competitive indirect ELISA for zearalenone using this antiserum had an assay detection limit of 10 ng/ml for the toxin. Cross-reactivity of the antiserum with α-zearalenol, β-zearalenol, α-zearalanol, and β-zearalanol were 33, 25, 6, and 10%, respectively.

Rapid Measurement of *Candida utilis* Dry Weight with Microwave Drying, Mark A. Buono and L. E. Erickson, Department of Chemical Engineering, Kansas State University, Durland Hall, Manhattan, Kansas 66506

J. Food Prot. 48:958-960

A microwave oven has been used to measure biomass concentration and construct a growth curve for *Candida utilis* ATCC 1084. Drying curve results show that when a sample was exposed to microwave radiation for 15 min, microwave and air oven dry weight results are within 4 mg of one another when dried at the "cook" power setting (approximately 630 W at full power). For biomass dry weight sample sizes of 147.74 and 14.42 mg, the sample weight was reduced to within 10% of the final air oven dry weight in less than 4 min. At the "defrost" power setting 7 min were required to reduce the sample weight to within 10% of the final air oven dry weight for the large sample. For the small sample, this point was not reached in 15 min. Microwave drying can be used to rapidly estimate microbial biomass concentration.

Production of Aflatoxins on Inoculated Teleme Cheese, Gregory K. Zerfiridis, Laboratory of Dairy Technology, Faculty of Agriculture, 54006 University of Thessaloniki, Greece

J. Food Prot. 48:961-964

Teleme cheese blocks inoculated with *Aspergillus parasiticus* were placed in plastic screw-cap containers and held at 5, 16 and 25°C. Three variables were examined at each temperature: (*a*) cheese without brine, (*b*) cheese partially immersed in 6% brine and (*c*) cheese completely immersed in 6% brine. No mold growth appeared at 5°C and no aflatoxins were produced when cheese was kept completely immersed in brine. Aflatoxin was lower in amount at 16 than 25°C and also lower in cheese partially immersed in brine than in cheese without brine. Aflatoxins B_1 and G_1 appeared to increase during all the incubation time of 7 weeks at 16°C, while at 25°C they reached a maximum in 3 weeks and decreased thereafter. Aflatoxins decreased in the order of G_1, B_1, G_2, B_2. After the first week of mold growth, a yellow color appeared in the cheese under mycelium, which color diffused into both the cheese and brine. However, aflatoxins diffused only into the cheese to a depth of not more than 2 cm and the amount decreased as the distance from the surface increased. Although mold growth and yellow color render the cheese unacceptable to the consumer, the best safeguard is to keep the cheese at 5°C or completely immersed in brine.

Restructured Pork from Hot Processed Sow Meat: Effect of Encapsulated Food Acids, Joseph C. Cordray and Dale L. Huffman, Department of Animal and Dairy Sciences, Alabama Agricultural Experiment Station, Auburn University, Auburn, Alabama 36849

J. Food Prot. 48:965-968

Encapsulated food acids were used in the manufacture of cured, restructured pork from pre-rigor sow meat. The four treatments were: (a) control, (b) sodium acid pyrophosphate (SAP), (c) sodium acid pyrophosphate plus encapsulated lactic acid (LA), and (d) sodium acid pyrophosphate plus encapsulated glucono-delta-lactone (GDL). Sodium acid pyrophosphate was included in three of the treatments in this study because of its ability to catalyze the curing reaction. Products were manufactured from timmings ground through a 3.2-mm plate on a plate grinder and tenderized muscle chunks ground through a 10-mm plate which were blended together in a ratio of 50:50. No significant differences existed among treatments for percent fat ($P>0.05$). According to sensory panels, the SAP and GDL treatments were rated as having a more intense flavor than the control treatment ($P<0.05$). Objective analysis revealed no difference in shear value, tensile strength, water-holding capacity, cooked yield or chilled yield. Significantly more of the total meat pigment was converted to nitroso-hematin in the GDL treatment as compared to the control treatment ($P<0.05$).

Comparison of Media for Isolation of *Bacillus cereus* from Foods, Mats Peterz, Christer Wiberg and Per Norberg, Biology Section, National Food Administration, Box 622, S-751 26 Uppsala, Sweden

J. Food Prot. 48:969-970

Three media for isolation of *Bacillus cereus* from foods were compared: mannitol-egg yolk-polymyxin (MYP) agar, polymyxin pyruvate-egg yolk-mannitol-bromothymol blue agar (PEMBA) and non-selective blood agar. Twenty-six of 45 samples of different reconstituted and incubated dry food products and 18 of 29 samples of milk and cream (incubated overnight) contained *B. cereus*. None of the media performed significantly better than the others as regards quantitative recovery or selectivity.

Inhibition of *Clostridium botulinum* Type E Toxin Formation by Potassium Chloride and Sodium Chloride in Hot-Process (Smoked) Whitefish (*Coregonus clupeaformis*), G. A. Pelroy, A. Scherer, M. E. Peterson, R. Paranjype and M. W. Eklund, U.S. Department of Commerce, National Marine Fisheries Service, NOAA, Utilization Research Division, NWAFC, 2725 Montlake Boulevard East, Seattle, Wshington 98112

J. Food Prot. 48:971-975

Whitefish steaks were brined in NaCl, KCl, or equimolar NaCl:KCl to contain similar chloride ion concentration and inoculated intramuscularly with 10 or 100 spores of *Clostridium botulinum* type E per gram of fish. Steaks were then heated in a simulated (i.e., without smoke) hot-smoke process to internal temperatures of 62.8° to 76.7°C (145°-170°F) for the final 30 min of a 2- to 3-h process, packaged under vacuum in oxygen-impermeable film, and stored at abuse temperature of 25°C. During 7 d of storage, toxin production was inhibited in steaks containing more than 0.66 ionic strength NaCl, 0.64 KCl, or 0.71 equimolar NaCl:KCl. The results indicate that it is feasible to substitute KCl for NaCl in hot-process smoked fish for inhibition of outgrowth and toxin production by *Clostridium botulinum* type E.

Use of the Osmometer for Quality Control of Ice Cream Mix, Robert J. Baer and Timothy P. Czmowski, Dairy Science Department, South Dakota State University, Brookings, South Dakota 57007-0647

J. Food Prot. 48:976-978

Fourteen brands of commercial vanilla ice cream, purchased at three different times, were analyzed for freezing point, firmness, fat, solids-not-fat, total solids, and net weight. Mean freezing points ranged from -2.65 ± .04 to -3.24 ± .19°C, which indicated ice cream composition and mix formulations varied. Values for mean penetrometer readings ranged from 120 ± 6.0 to 193 ± 34.9 mm; fat, 9.3 ± .23 to 16.8 ± .20%; solids-not-fat, 25.2 ± .17 to 29.6 ± .64%; total solids, 35.5 ± .25 to 42.0 ± .26%; and net weights, 1.026 ± .045 to 1.756 ± .017 kg/1.89 liter. The freezing point osmometer has potential use as a rapid quality control instrument to measure the freezing point of ice cream mix and detect when improper quantities of soluble mix ingredients have been incorporated into the mix. More testing of mix formulations will improve product uniformity and quality and assure compliance with regulatory standards.

Detection of Penicillin and Streptomycin in Milk by Impedance Microbiology, O. N. Okigbo and G. H. Richardson, Department of Nutrition and Food Sciences, Utah State University, Logan, Utah 84322

J. Food Prot. 48:979-981

A Bactometer 123 impedance instrument detected .001 IU penicillin or streptomycin/ml of sterile milk inoculated with 5% active lactic culture. Results were available in 5 to 10 h. Inactive lactic culture produced results in less than 24 h. Impedance instruments can monitor incoming milk supplies simultaneously for bacterial load, abnormal milk, and antibiotics.

Enumeration of Hydrogen Sulfide-Producing Bacteria from Anaerobically Packaged Pork, F. Fernandez-Coll and M. D. Pierson, Department of Food Science and Technology, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061

J. Food Prot. 48:982-986

The influence of medium composition, pH, incubation time and gaseous atmosphere during incubation on enumeration of H_2S-producing bacteria from anaerobically packaged pork was determined. Samples of anaerobically packaged pork were plated and H_2S-producing bacteria isolated. Stock cultures of these isolates were prepared, diluted and pour-plated with Lead Acetate Agar (LAA) containing various concentrations of cysteine (0.001 to 0.005%) at different pH values (5.0 to 8.0). The inoculated plates were incubated at 21°C for various periods (3 to 6 d) under different gaseous atmospheres (N_2, CO_2 or mixtures of both). The conditions resulting in optimized recovery and enumeration of H_2S-producing bacteria from anaerobically packaged pork consisted of pour-plating the isolates with LAA to which 0.003 to 0.005% cysteine was added and pH adjusted to 7.5-8.0 plus incubation in an atmosphere of 5%CO_2-95%N_2 for 5 to 6 d at 21°C.

Detection of Residues of Hydrogen Peroxide in Pasteurized Cream, Robert G. Black and Bronwyn R. Cunnington, Gilbert Chandler Institute of Dairy Technology, Princes Highway, Werribee, Victoria, Australia 3030

J. Food Prot. 48:987-989

A method used to detect hydrogen peroxide in milk was adapted by changing sample size and precipitant. Cream is mixed with tungstic acid, filtered and hydrogen peroxide in the filtrate is reacted with titanium tetrachloride to produce a stable yellow-colored complex absorbing at 415 nm. Average recovery of hydrogen peroxide from freshly prepared cream was 78% and it decomposed rapidly in refrigerated cream to 50% of original concentration in 24 h before stabilizing. Accuracy was calculated as 10% relative over the range 0-100 μg/g and repeatability was 2 μg/g. A survey of 25 commercial cream samples ex factory and tested fresh revealed that 13 contained from 10 to 60 μg of hydrogen peroxide/g. It was considered this confirmed that hydrogen peroxide had been added. Commercial indicator strips for hydrogen peroxide gave reliable indications of its presence in creams for levels above 10 μg/g.

Foodborne and Waterborne Disease in Canada - 1978 Annual Summary, E. C. D. Todd, Bureau of Microbial Hazards, Food Directorate, Health Protection Branch, Health and Welfare Canada, Ottawa, Ontario K1A 0L2, Canada

J. Food Prot. 48:990-996

Data on foodborne disease in Canada in 1978 are compared with data for 1977. A total of 836 incidents, comprising 642 outbreaks and 194 single cases, causing illness in 5960 persons was reported for 1978. The number of incidents and cases increased by 7.5% and 23.9%, respectively, from 1977 to 1978. Like the previous year, *Salmonella* spp. were responsible for more incidents (67) and cases (2171) than any other agent. Other incidents were caused by *Staphylococcus aureus* (31), suspect mold and yeast (17), *Bacillus cereus* (9), *Clostridium perfringens* (7), *Clostridium botulinum* (6), and *Shigelli sonnei* (1). Four incidents of trichinosis, and two each of mushroom, lupin alkaloid and paralytic shellfish poisoning occurred. One scombroid poisoning outbreak was reported. Chemicals implicated in causing illness included tin, rancid compounds and extraneous matter. The deaths of five persons were attributed to foodborne disease. About 32% of incidents and 39% of cases were associated with meat and poultry. Vegetables, fruits, bakery products and marine products were also important vehicles in causing foodborne disease. Mishandling of food took place mainly in foodservice establishments (25.6% of incidents, 56.1% of cases) and homes (12.4% of incidents, 6.4% of cases). However, mishandling by manufacturers caused some problems including salmonellosis from iced cakes made with cracked eggs and staphylococcal intoxication from ham, sausage, chicken and canned salmon. Over 54% of reported foodborne disease incidents occurred in Ontario and more than 18% in British Columbia, but the number of incidents per 100,000 population was highest in the Northwest Territories. Narrative reports of selected foodborne incidents are presented.

Safety and Shelf-Stable Canned Cured Meats, A. H. W. Hauschild and B. Simonsen, Microbiology Reserach Division, Health Protection Branch, Tunney's Pasture, Ottawa, Ontario, Canada K1A 0L2 and Danish Meat Products Laboratory, Howitzvej 13, DK-2000 Copenhagen F, Denmark

J. Food Prot. 48:997-1009

Shelf-stable canned cured meats (SSCCM) are preserved by thermodestruction of the vegetative microflora, partial destruction of the microbial spores, and subsequent inhibition of the surviving spores. Inhibition depends primarily on the concentration of salt, nitrite input and the severity of the thermoprocess. On the basis of published experimental work, the botulism risk of SSCCM may be estimated, either as the equivalent of the decimal heat destruction of spores, taking into account the combined destruction and inhibition in SSCCM (log 1/P), or as the decimal number of cans needed for a single can to become toxic, i.e., log $1/(P \times i)$, where P is the probability of individual spores developing and producing toxin in the processed can, and i is the incidence of *Clostridium botulinum* spores in the raw product. The experimental data demonstrate that the 12 D concept (or its equivalent) is not applicable to SSCCM and cast doubt on the adequacy of the F_o value as a measure of the effective heat treatment for this type of product. Research data on the safety of SSCCM are limited and do not allow us at present to propose minimal requirements of the essential safety factors. Instead, our risk assessment relies heavily on commercial practice and experience. In analogy to log $1/(P \times i)$, the safety of commercial cans is expressed as the decimal number of cans produced per can causing severe illness, arbitrarily designated SU (safety units). Estimated SU values for defined commercial luncheon meats, canned cured ham and sausages, range from >7 to >9. Provided that the microbial spore levels of both the raw meat and non-meat ingredients of SSCCM are rigidly controlled, the SU estimates allow us to specify minimum safety requirements for the major groups of shelf-stable canned cured meats.

Calendar

1985

November 5-7, TECHNOLOGY OF BAKING, to be held in Las Vegas, NV. For more information contact: Mrs. Donna Mosburg, Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

November 6, SANITATION THRU DESIGN, Las Vegas. Contact Shirley Grunder at 913-537-4750 or write: Shirley Grunder, Sanitation Education Department, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

November 11-15, CRACKER PRODUCTION COURSE, Manhattan, Kansas. Contact Bev Martin at 913-537-4750 or write: Bev Martin, Research Department, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

November 13-15, GUM CHEMISTRY AND TECHNOLOGY IN THE FOOD INDUSTRY, to be held at the Holiday Inn, Chicago City Centre in Chicago. IL. For more information contact: Raymond J. Tarleton, 3340 Pilot Knob Road, St. Paul, MN. 612-454-7250.

November 20, UNIVERSITY OF MARYLAND'S 41ST ANNUAL DAIRY TECHNOLOGY CONFERENCE, University of Maryland, Center of Adult Education - Room 1123, University Blvd. at Adelphi Road, College Park, MA. For more information contact: Dr. James T. Marshall, Department of Animal Sciences, University of Maryland, College Park, MA. 20742. 301-454-7843.

November 27, ONTARIO FOOD PROTECTION ASSOCIATION MEETING, to be held at the Holiday Inn, 970 Dixon Road, Toronto, Ontario. For more information contact: J. Willekes, P.O. Box 79, Streetsville, Ontario L5M2B7. 416-288-3050.

December 2-4, TECHNOLOGY OF TORTILLAS, Manhattan, Kansas. Contact Donna Mosburg at 913-537-4750 or write: Donna Mosburg, Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502.

December 6, SIXTH ANNUAL FOOD MICROBIOLOGY SYMPOSIUM, to be held at Room 201-202 Student Center, University of Wisconsin-River Falls. For more information contact: Dr. P. C. Vasavada, Food Science Department, University of Wisconsin-River Falls, River Falls, WI. 54022. 715-425-3150.

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January 14-16, 11TH ANNUAL MEETING TROPICAL AND SUBTROPICAL FISHERIES TECHNOLOGISTS, to be held at Holiday Inn, International Airport, Tampa, FL. For more information contact: John Koburger, 449 Food Science Building, University of Florida, Gainesville, FL 32611. 904-392-1991.

February 5-6, FOOD PROCESSORS' SANITATION WORKSHOP, Presented by the University of California Cooperative Extension, Food Processors' Sanitation Association, and Golden Gate Chapter of the Environmental Management Association, along with representatives of various food trade associations. For more information contact: Kathryn Boor, Food Science and Technology, University of California, Davis, CA 95616. 916-752-1478.

February 12-13, DAIRY AND FOOD INDUSTRY CONFERENCE, to be held at Ohio State University. For more information contact: John Lindamood, Department of Food Science and Nutrition, 2121 Fyffe Road, The Ohio State University, Columbus, OH 43210.

February 24-26, 12TH ANNUAL TECHNICAL SEMINAR, to be held at the Holiday-Inn University Center, Gainesville, FL. For more information contact: ABC Research Corporation, 3437 SW 24th Avenue, Gainesville, FL.

March 24-28, MID-WEST WORKSHOP IN MILK AND FOOD SANITATION, to be held at Ohio State University. For more information contact: John Lindamood, Department of Food Science and Nutrition, 2121 Fyffe Road, The Ohio State University, Columbus, OH. 43210.

April 14-18, FRUIT AND FRUIT TECHNOLOGY RESEARCH INSTITUTE INTERNATIONAL CONFERENCE to be held at the CSIR Conference Centre, South Africa. For more information contact: Symposium Secretariat S.341, CSIR, P.O. Box 395, Pretoria 0001, South Africa. Telephone: 012 869211 x 2063. Telex: 3-630 SA.

April 23, SANITATION WORKSHOP FOR THE FOOD PROCESSING AND FOOD SERVICE INDUSTRIES, to be held at Inn at the Park, Anaheim, CA. For more information contact: Kathryn Boor, Food Science and Technology, University of California, Davis, CA 95616. 916-752-1478.

April 29-May 1, WORKSHOP ON TRACE ANALYSIS OF FOODS. For more information contact: G. Reineccius, Department of Food Science and Nutrition, University of Minnesota, 1334 Eckles Avenue, St. Paul, MN 55108. 612-373-1438.

May 12-14, PENNSYLVANIA DAIRY SANITARIANS ASSOCIATION MEETING, to be held at Pennsylvania State University. For more information contact: Sidney Barnard, Pennsylvania State University, 8 Borland Lab, University Park, PA 16802. 814-863-3915.

May 26-31, 2ND WORLD CONGRESS FOODBORNE INFECTIONS AND INTOXICATIONS will take place in Berlin (West) at the International Congress Centre (ICC). For more information contact: FAO/WHO Collaborating Centre for Research and Training in Food Hygiene and Zoonoses, Institute of Veterinary Medicine (Robert von Ostertag-Institute), Thielallee 88-92, D-1000 Berlin 33.

June 29-July 2, 29TH CONFERENCE OF THE CANADIAN INSTITUTE OF FOOD SCIENCE AND TECHNOLOGY, to be held in Calgary, Alberta, Canada. For more information: Terry Smyrl, Ph.D., Alberta Horticultural Research Center, Brooks, Alberta, Canada, T0J 0J0. 403-362-3391.

July 12-19, SIXTH INTERNATIONAL WORKSHOP ON RAPID METHODS AND AUTOMATION IN MICROBIOLOGY, to be held at Kansas State University. For more information concerning Program contents contact: Daniel Y.C. Fung, Call Hall, Kansas State University, Manhattan, KS. 66506. 913-532-5654. For registration information contact: Joe Pittle, Conference Center, Wareham building, Anderson Avenue, Manhattan, KS 66502. 913-532-5575.

July 15-19, PURDUE CANNERS TECHNICIANS MOLD COUNT SCHOOL. For more information contact: Dr. James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907. 317-494-8279.

AUGUST 3-7, IAMFES ANNUAL MEETING to be held at the Radisson South, Minneapolis, MN. For more information contact: Kathy R. Hathaway, IAMFES, Inc., P.O. Box 701, Ames, IA 50010. 515-232-6699.

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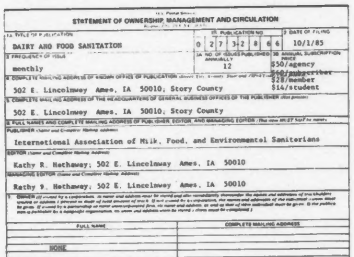
AUGUST 2-6, IAMFES ANNUAL MEETING to be held at the Disneyland Hotel, Anaheim, CA. For more information contact: Kathy R. Hathaway, IAMFES, Inc., P.O. Box 701, Ames, IA 50010. 515-232-6699



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