

## PRECOOKED FROZEN FOODS AND THE NEW HANDLING CODE<sup>1</sup>

A. H. ROBERTSON

*State Food Laboratory*

*Department of Agriculture and Markets,*

*Albany, New York*

The origin of and membership in the Association of Food and Drug Officials of the United States is described. The formation in 1956 and the objectives of the Joint Committee on Frozen Foods in the above Association with representatives of the National Association of Frozen Food Packers is explained. The Committee was directed to prepare a model processing and handling code for uniform guidance of both industry and public servants.

Industry has surveyed operations, including bacterial determinations on products at different stages of processing in several precooked frozen food processing plants. Any product consisting in part of meat, poultry, gravy, sauce or stuffing is readily subject initially to plant mishandling and should be processed with minimal delay.

Sanitarians are urged to be practical, understanding, cautious and conservative when using the new tools in the recommended code; nevertheless, industry's familiarity with and early use of it will do much to maintain frozen food quality at a high level.

Will you keep in mind 1956, the half-century mark after passage of the 1906 Federal Food and Drug Act. At the commemorative meeting sponsored by the Association of Food and Drug Officials of the United States, hereinafter called AFDOUS, the National Association of Frozen Food Packers (NAFFP) offered to cooperate with the former in preparation of a model frozen food processing and handling code. Parts of the code are complete except for final editing.

Both prior and subsequent to 1956, many sanitarians had found certain lots of precooked and ready-to-eat frozen foods with bacterial counts in the millions and some containing coagulase positive staphylococci. The conditions of processing influence the bacterial content of frozen food before freezing. The temperature during warehousing, transportation and retailing and the manner of refrigeration and preparation in public eating places and in homes influence the subsequent growth of microorganisms. From the quick freeze stage until processed by the consumer, the internal product temperature should not exceed 0°F.

At one time it was thought that bacterial tests on retail samples might differ from those on the same

food immediately after quick freezing or as delivered at warehouses. In May 1958 Abrahamson *et al.*, on different sets of samples (Quart. Bull. Assoc. Food & Drug Officials, 23: 63. 1959) showed no distinctively higher trend among counts on retail samples than among those on warehouse samples. This means that plant sanitation and quick freezing are of first importance. Storage at 0°F. will not permit growth of coagulase positive staphylococci. Gunderson has shown that occasionally off-flavor producing organisms will grow slowly at surprisingly low temperatures approaching 0°F. Conditions conducive to bacterial growth are enhanced as the amount of free water increases when frozen foods begin to thaw. Hence, the need to keep frozen foods at not over 0°F. is obvious. The same principle of keeping perishable foods refrigerated applies equally to all commercial types of non-frozen foods. It also applies to perishable types prepared and stored in the home.

### DEVELOPMENT AND ACTIVITIES OF AFDOUS

What is AFDOUS? AFDOUS was born ten years before enactment of the 1906 Federal Food and Drug Act. Its official membership consists of federal, state, county and municipal workers charged with enforcing the food, drug and cosmetic laws. Annual conferences of AFDOUS membership serve as opportunities to present formal papers, progress reports and open discussions, to explore the best thinking on food handling and to secure uniform regulatory policies.

AFDOUS is blessed with a companion group of Associate Members from the food, drug and cosmetic industries, which meets jointly with it during open sessions. When needs arise, such as the absence of a uniform guide for processing and handling of frozen foods, AFDOUS appoints a committee chairman, who selects qualified members, explores the subject and makes recommendations for appropriate action. Carroll S. Brinsfield and Herman P. Schmitt, from AFDOUS and NAFFP respectively, are co-chairmen of the joint task Committee on Frozen Foods. Representatives from the Federal Food and Drug Administration, the U. S. Public Health Service, the Meat Inspection Branch, the new Poultry Inspection Branch and the Western Utilization Re-

<sup>1</sup>Presented at the 46th Annual Meeting of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC., at Glenwood Springs, Colorado, August 26-29, 1959.

search Branch Laboratories of the U. S. Department of Agriculture, the Bureau of Commercial Fisheries, Marine and Rail Transport Association, the American Trucking Association, the Refrigeration Research Foundation, etc., have participated in one or more meetings of the Committee on Processed, Canned and Frozen Foods in cooperation with the National Association of Frozen Food Packers.

AFDOUS has no authority for enforcement. However, each enforcement agency, — national, state, county or municipal, — may have its own laws and codes enabling each to enforce uniform regulations. Wherever there is misunderstanding about regulations, conferences with industry will be most helpful to processors, warehousemen, distributors and retailers. Industry sponsored personnel training schools are helpful also. Conferences might be extended to include housewives at question and answer sessions.

PROGRESS IN THE DEVELOPMENT OF FROZEN FOOD CODE

Before 1956 some cities and states had some form of a frozen food handling code. In 1955, one legislature gave authority to draft regulations. Another state was enforcing regulations for processing crab meat. New York City was gathering information and enforcing certain frozen food handling requirements. Even in 1946 Nassau County Health Department on Long Island had proposed a frozen food handling code. Obviously if each state acted independently, industry would face multiple codes and multiple interpretations of conformance. To avoid such confusion and to present new information on frozen food handling practices, representatives from the National Association of Frozen Food Packers with others having related interests met in May 1956 with the AFDOUS committee, Chairmanned by Milton P. Duffy, California Department of Health.

Following this conference, industry through NAFFP has surveyed routine procedures in plants preparing precooked frozen foods so as to measure mishandling practices in terms of bacterial count trends. Gail M. Dack from the University of Chicago has guided the plant surveys and has actively participated in many of them.

Early in 1958 a separate survey was conducted in 34 states and the District of Columbia jointly by industry and by regulatory workers to determine the temperatures of the food and of the air in display cabinets and of frozen food storage practices in 3,063 stores. Carroll S. Brinfield, Chief, Division of Food Control, at Baltimore, summarized this record on March 4, 1958, at the National Association of Frozen Food Packers Convention. Management in about two-thirds of the stores inspected requested a copy of the summarized record for guidance of their oper-

ations. Because of misunderstanding in a few instances, management abused the inspector.

Of first importance in the basic survey was the selection of bacterial tests which were informative and practicable so that any reasonably well equipped industrial or control laboratory may assess the bacterial conformance of frozen foods in terms of good commercial processing. Representatives from industry, certain state and city health laboratories, the Canadian Food and Drug Directorate, the U. S. Public Health Service, the Federal Food and Drug Administration and others have aided in the development of methodology for measuring sanitation in handling frozen foods. Tests selected were total counts by the agar plate method, coliforms by MPN method and the determination of the number of coagulase positive staphylococci. The significance of such tests need no explanation. If need arises for supplemental tests control laboratories should apply them with discretion. Information on methodology is available on request at NAFFP, 919 at 18th Street, N. W., Washington 6, D. C.

Quoting from the committee report at Boston, the record of progress is as follows:

"At the May 1959 conference of NAFFP and AFDOUS in New York considerable time was spent reviewing all the data accumulated on the bacterial content of precooked frozen foods. It was decided to suggest bacterial standards for pot pies and dinners at that time. Major discussions ranged from 50,000 to 100,000 per ml. We did not have the time to set recommended sampling procedures and make some practical changes in methodology to shorten the laboratory work. However, the greatest amount of discussion came when we tried to get a tentative agreement on staphylococci and coliform counts. The majority present realized the ideal counts for staphylococci and fecal coliforms should be zero. They also agreed that setting our sights at the above mentioned figure was unrealistic at this time. After a lengthy debate it was agreed to set an MPN of not more than 100 for total coliform and staphylococci. Several of us were not satisfied with those figures, believing they were too liberal. Finally it was decided to reopen the coliform and staph tentative standards at our next meeting which will be on October 15 and 16, 1959, in Washington. This will provide time to evaluate all data and correlate coliform and staphylococcus counts with sanitary conditions and practices observed in the plants sampled."

Tests suitable for precooked frozen foods are probably applicable to cream filled pies, cakes and puffs, crab and fish cakes, chicken a la king, poultry stuffing, chili con carne, chopped liver, shrimp and lobster in thickened sauces, etc. However, due to differences in the growth medium and lower pH values, the above tests may not be applicable to most frozen fruits, fruit juices, fruit juice concentrates, and frozen vegetables.

## FROZEN FOOD SANITATION PRINCIPLES

Food sanitation starts with the location and construction of the building. Next comes interior wall surfaces, floor materials, drainage, absence of litter and refuse, and the abundance of and ready access to running water for all line employees. Floor plans should prevent persons from handling alternately cooked meats and the raw products on the dressing and preparation lines. In plants where employees must handle both cooked and raw foods, operations should be continuous and rapid and cooked products should be handled only after employees have thoroughly scrubbed their arms and hands and changed their protective garments. If live animals and poultry are slaughtered, a separate receiving dock should be provided.

The ready access to and an abundance of running water for washing and water at 180°F. for sterilizing instruments and equipment is an absolute essential. As determined by the accumulation of refuse and the failure of equipment to be maintained reasonably free from residues, plants should be shut down for clean ups as needed at 3 to 6 hour intervals.

Some ingredients such as dried eggs, dried yolks, frozen eggs, frozen yolks, powdered skim milk, flours, starches, spices, broths, batters, sauces and gravies may contain many bacteria and mold spores. It is surprising how grossly contaminated some dry products may be. Some perishable ingredients, when prepared in large amounts, may be held too long (as much as 10 days in some cases) at ordinary refrigerator temperatures before the last of a batch is used.

New processing equipment and attempts at automation have not always prevented the introduction and growth of bacteria. In some instances, the construction of the equipment has prevented or restricted proper cleaning. Dough mixers, holding and mixing tanks, powder and flour blenders, dicers, slicers, cutters, butting boards, valves, pumps, pipeline fittings, etc., are included in the poorly designed equipment in which residues accumulate and often are not completely removed by cleaning. The selection of metals for equipment and the character of their surfaces determine their suitability. Unshielded air driven motors may drive contaminated air into the food.

Improvements can be made in conveyor belts so that they collapse or telescope sufficiently to dislodge residues when exposed to thorough cleaning treatments. Mesh belts ordinarily do not permit adequate cleansing. CIP cleaning for piping must follow precise CIP directions with no options or shortcuts. Permanent joints should be butt-welded, not lap-welded. Interior corners of containers should be

constructed so as to enhance good drainage and cleanability. From the above, it is apparent that proper frozen food processing equipment differs relatively little in construction from that identified by 3A sanitary standards for the dairy industry and that in the sanitary standards developed by the baking industry.

In some plants poor operational planning, breakdowns in equipment, etc., may cause extended delays and in-line products are allowed to pile up without refrigeration. If the food is kept under 45° or above 160°F., microbial growth rates are held reasonably in check. On some occasions, as a breakdown in quick freeze operations, the delay may be for several hours. Here and there several packages may be set aside accidentally until some observing eye sees them. The sanitarian seldom sees these delays which may account for unexplained high bacterial counts in individual packages.

Quick freezing is next. Freezing methods differ and therefore only the method best suited for freezing a certain food should be used. Use of some older types of freezers and packaging in wholesale size containers before freezing often delays the internal temperature drop to 0°F. for as much as 48 hours.

Warehouse storage of frozen foods is usually satisfactory. Break-up rooms often may not be maintained at 0°F. It is well to watch for this failure because some lots of foods may remain in the break-up area much longer than the owner thinks they do. Air temperature and internal product temperature should be recorded.

Rail transportation of frozen foods at not over 0°F. has improved appreciably in the last decade. Delays often occur during loading. Use of covered conveyors direct from storage to car aid in rapid handling of foods. Some frozen foods are palletted direct to the cars. Despite all controls, it is well to check, enroute and at destination, the temperature of representative cases and in particular those near car doors.

Truck transportation at not over 0°F. is improving. The American Trucking Association has recognized that it has been slow in programming for suitable trucks. The Association aims to replace trucks so that by 1964 or 1965 all trucks for frozen foods will be equipped to operate enroute at not over 0°F. Rapid transfer of frozen foods to precooled trucks is an essential also. It is well to check temperatures on cases near the doors on trucks enroute and at destination.

Some distributors and retailers still do not differentiate between freezing, as water freezes at just under 32°F., and the need to keep frozen foods at 0°F. Back-room storage at 0°F. is not always provided. Products are frequently displayed in cabinets above

the product load-line. Dial type thermometers with probe tips are suitable for determining internal product temperatures.

In 1956, a representative from the Refrigerated and Frozen Products Research Advisory Committee and the National Frozen Food Distributors Association alleged that the weakest link in the distribution chain is at retail, where the frozen foods often may be treated as dry groceries and not like ice cream. He blames high pressure sales tactics of some organizations for the skimping and corner-cutting sometimes practiced in distribution. If a distributor can get by with two trips a week instead of three, he will load the retailer with frozen foods beyond the latter's capacity for storage at not over 0°F.

Results of the first large scale comparative studies to measure quality chemically and organoleptically on separate packages from the same pack were reported in 1956 from the U. S. Western Utilization Research Branch Laboratories at Albany, California. These studies, still continuing, show that the rate of quality deterioration doubles with each 10° rise above 0°F. The observations included exposure of replicate samples at 5°, 10°, 15° and 20°F. for intervals of 5, 10, 15 and 20 days by varying both the order of temperature changes and the order of time intervals. Each panel judge was shielded from other judges and the food lighted dimly so its color would not influence flavor judgements when rating the degree of quality change. On request, reprints of many of the separate studies at WURB Laboratories are available. Off-flavored or discolored foods do not encourage a customer to come back for more. The above facts are summarized to fortify your advice to retailers who want repeat sales.

Let us look at how foods are preserved in general. Each consumer package of frozen foods is surrounded by a protective coating and is then preserved by quick freezing and holding at 0°F. Consumer packages of canned goods are enclosed in a sealed container and are then preserved by heat in retorts. Some fresh fruits and vegetables have their own protective covering.

Loose talk and suggestive thinking lead to confusion because frozen foods begin to deteriorate quality-wise once preservation by proper freezing ceases. Other foods are perishable as soon as that shell which protects them is broken. Perishability is suddenly translated into terms of spoilage. Spoilage is then translated into terms of decomposition. Then decomposition implies food poisoning.

Following a recent request for transcripts of proven cases of illness caused solely by commercial frozen foods as purchased, the Epidemiological Division of the U. S. Public Health Service furnished one record

on frozen turkey. It was prepared by thawing about 7 hours after removal from freezer, and then roasted, cooled and sliced before placing for 5 to 12 hours in refrigerated storage before serving. During cooling and after slicing the meat was covered with a cloth. The local health department in a densely populated area reported that of about 300 guests eating at a private establishment, 41 ate portions of the suspected food. Despite circumstantial evidence, several facts remain unanswered to prove conclusively that the illness of 40 among the 41 eating the turkey was caused solely by a condition of the turkeys as purchased. Among these is the absence of other recorded cases of illness caused elsewhere by eating turkeys with the same warehouse lot identity. The record did not show whether bacterial tests were made on stuffings, gravies, etc., served with the sliced meat or on other frozen turkeys of the same lot in local storage. It did show that specimens from 12 of 19 food handlers at the establishment were positive.

Some of the above investigations may have been overlooked and some may have been completed but not reported. Please do not misunderstand the remarks as condoning plant insanitation or the practice of refreezing defrosted foods if data show that such things may have occurred. Emphasis is placed on the need for thorough investigations before deducing conclusions which may lead to false allegations.

When foods are maintained at 0°F., it assures that bacterial growth is practically halted and, if so held, the terms spoilage and decomposition ordinarily do not apply unless the food is grossly mishandled. Such gross mishandling usually furnishes sufficient evidence for condemnation with no hesitation by any segment of the industry. It is equally conceivable that non-frozen foods and those prepared in our homes occasionally may be grossly mishandled.

The sale of precooked and ready-to-eat prepared frozen foods is expanding and new personnel in the business need guidance. In 1957 the U. S. Department of Agriculture listed more than 200 prepared frozen foods, which is exclusive of the long list of frozen fruits and vegetables. Any product consisting in part of meat, poultry, gravy, sauce or stuffing is readily subject initially to plant contamination and should be processed, including the quick freeze stage, with minimal delay. In case of defrosting, each case must be judged very carefully before a decision is made on safety, because spoilage is apt to develop rapidly in these foods. Because of perishability, decisions often can not be delayed.

Parts of the recommended code for warehousing, transporting and retailing were approved in 1959 and are multilithed now for the timely guidance of

both industry and public servants. As soon as certain data can be re-examined, AFDOUS — NAFFP aim to recommend bacterial standards by which good manufacturing practices can be judged. Among other incomplete parts are recommendations for locating, constructing, equipping and operating processing plants. When complete, it is expected that the edited code will be applicable to all commercial frozen foods.

After proper processing, insistence that internal product temperatures of frozen foods be not over 0°F. is the least costly way for sanitarians and industry to guarantee quality. If temperatures are maintained properly, such records should satisfy 95 percent of the regulatory efforts to assure both safety and quality. The cost of routine bacterial tests by regulatory agencies is prohibitive. Bacterial tests may be required to establish facts in individual cases.

How many of you require in food processing plants and in retail stores that they have a detailed set of operational directions? Without a set, how does the management know in case of sickness, vacations, emergencies, etc., that someone will not be pushed on a job that he knows relatively little about? Because no set of general directions will apply industry-wide, would it not be better for each management, possibly with general guidance from NAFFP in case of frozen foods, to write its own directions in words that are understandable and explainable to employees.

Copies of such directions could be filed with sanitarians' reports on inspections. Placards bearing appropriate instructions can be placed above or near processing lines wherever they are needed most to remind employees and thus prevent errors due to neglect or failing memory. Attention was directed recently to one business where an employee had a card on which he recorded the completion of certain duties, such as clean-up jobs. When performed, he had the foreman examine the job and then initial and

date the report. To be sure, this would not be satisfactory for all jobs but it could be tried out on some.

Just let me quote from the transmittal letter on June 24, 1959, by Carroll S. Brinsfield concerning the code:

"In my humble opinion, there should be no attempt to enforce these handling sections until a year after they are formally adopted by your agency. However, I think it is wise for both industry and enforcement agencies to start planning for the day that such regulations become effective. If everyone starts practicing their part in fulfilling their obligations to the code — whether they be in industry or enforcement — they will approach the effective date with a minimum of problems."

"The use of these sections of the code will materially aid in up-grading frozen foods. Yet, these sections are new tools and must be handled with extreme care. You must be practical, understanding, cautious, and conservative in their application."

"Educating all segments of industry effected by these sections as to the 'hows' and 'whys' will improve public relations. Let tolerance be your motto on violations until those conscientious members of industry have had a chance to solve their problems."

"In addition to approving the frozen food handling code, AFDOUS also approved an administrative tolerance on 0°F. for the warehousing, retailing and transportation sections. Those states that are considering the possibility of adopting a regulation on frozen food handling may obtain a copy of this tolerance on request to this (meaning Mr. Brinsfield's) office. Needless to say, the tolerance is known only to regulatory officials."

In this discussion your attention has been directed to the code in the interests of establishing uniform policies, of preventing insanitation and of preserving frozen foods qualitywise. Only as the result of many conferences has it been possible to bring this timely information to you. All credit goes to the chairmen and members of the committees for their persevering work. Each sanitarian is a share-holder in the big job of assuring safety and of maintaining quality of commercially frozen foods.