Report of Committee on Frozen Dessert Sanitation

THERE should be and in many instances there is a great revival in ice cream and frozen dessert sanitation. During the War, sanitation, like a great many other things was neglected. Along with sanitation went the high quality of the products. Anything would sell at a good profit so why bother with quality. This was a mighty tempting situation for the company with weak moral fiber. It likewise was hard on the manufacturer who placed quality first for he had to suffer at the hands of the unscrupulous manufacturer in many different ways. However, the wise and far-seeing company maintained their quality and built for the future.

Every health department should, if they have not already done so, start an intensive campaign to correct the bad habits of sanitation that were tolerated during the War. Make them clean up, and replace old, rusty, delapidated and antiquated machinery and equipment with modern machinery and equipment. Make them clean up and stay clean. They will appreciate it and thank you for it.

INDUSTRY AHEAD OF INSPECTORS

It has been my observation over a period of 30 years or more that industry is always ahead of the sanitary inspector. The reverse should be true if the inspector knows his business and keeps up-to-date on all the latest developments not only in machinery and manufacturing but in sanitation. For example, how many inspectors know what industry plans for the future? How these plans will affect the product?

The chief concern of the ice cream industry at present is to increase per capita consumption of ice cream. Their goal is one billion gallons per year within the next ten years (1955). This is a big increase in consumption when you consider that they sold less than half that amount in 1945. Their program as outlined by the Executive Secretary, R. C. Hibben, is (a) Quality of Products, (b) Aggressive but intelligent merchandising, (c) Good public relations, (d) Sensible industry relations, (e) Meeting competition outside the industry, (f) Intelligent handling of detrimental legislation, and (g) Taking advantage of new inventions and new economic conditions. The above doubtless represents the thinking of the frozen desserts industry at the moment and their plans for the next few years.

It is interesting to note that their first consideration is quality. In discussing quality, they point out that quality should not be confused with richness in ice cream. The average ice cream before the war contained 12.5 percent butterfat and 10.5 percent total milk solids. If properly made with quality products as basic ingredients, no finer ice cream can be produced than made under the above average formula.

FUTURE DEVELOPMENTS IN ICE CREAM MIXES

Will the dry ice cream mix replace the fresh liquid mixes? The answer is No, both will be used. The dry mix was developed as a war time measure, and fulfilled a great need since it occupied small space and could be shipped great distances. However, it must now compete with fresh liquid mix on more even terms. The best opinion at the moment is that the future acceptance of dry mix in this country depends upon its cost, convenience, and quality. Its greatest acceptance in any event will be by the housewife and the

manufacturer-retailer. Dr. Krog in his report discusses some of the sanitary implications and problems of control of dry mix.

Frozen cream, plastic cream, and unsalted butter will be used in many parts of the country due to the scarcity of fresh cream. Each year progress is made in improving the quality of these products. They are usually used to supplement fresh cream in making ice cream. None make as fine an ice cream as good quality fresh cream. If over 50 percent frozen cream is used, a stale flavor often results. These are some of the more important problems in the ice cream industry.

Reports of other members of the Committee follow: These are always interesting since they reflect the problems and thinking from a wide variety of places.

ICE CREAM IN CANADA

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Due to the continuation throughout the year of government orders respecting the composition of ice cream and the volume of mix manufactured, there have been no material changes in the Canadian ice cream industry. Ingredients, such as fruits, dried skimmed milk, and gelatin are still in relatively short oveall supply, and although slight increases were made in sugar quotas the trade is still restricted to seventy per centum of their 1941 usage. Sufficient supplies of glucose, corn syrup, etc. were not always available as substitutes. Such conditions have affected the quality of ice cream, with the result that in some districts, quality is below that of last year. At times, some firms were obliged to use fairly large proportions of sugar substitutes (up to 50 percent of total sweetening agents), and it was found that some brands of glucose imparted undesirable flavors to the finished ice cream. Thus some vanilla ice cream had almost a butterscotch color due to the use of poor quality glucose and partially caramelized roller process skimmilk powder. It has also been noticed that when the serum solid content of ice cream was over 12½ percent and one half of the sweetening agent was glucose, the finished ice cream had almost a chalky texture. This is very noticeable when the ice cream has been held in storage for any length of time.

The ice cream manufacturer today is quite concerned about the increase in cost of his basic mix. The recent (1st October) increases in the price of milk to producers supplying all fluid markets has caused corresponding increases in the price of surplus milk and fat from such markets. Prices of imported ingredients are, in many cases, somewhat higher, and as the retail and wholesale ceiling prices of the finished ice cream are still in effect across Canada, the manufacturer has been endeavoring to lower the initial cost of his finished mix. Reductions have been made in several ways, such as (1) reduction of dried egg yolk content, (2) lowering the fat content to a figure closer to the legal minimum of 9.5 percent, (3) lowering the total solid content to a figure closer to the legal minimum of 34 percent, instead of being 35 percent and upwards, and (4) closer overrun control with a maintenance of 110 to 115 percent on bulk ice cream.

The amount of new equipment available for distribution to the trade was not as large as anticipated, due largely to shortage of raw materials and labor difficulties. However, reports from all parts of Canada indicate that both large and small manufacturers are anxious to improve their facilities and install modern equipment, all of which augurs well for future progress.

As would be expected, ice cream has continued in short supply throughout the year, but consumers generally appear to have accepted this condition quite readily. The overall production

of ice cream in Canada has been slightly lower during 1946 compared with the previous year, due largely to almost complete demobilization of the armed forces. However, the industry as a whole is still optimistic as to the future, for it feels that as soon as government restrictions are removed and ingredients are in plentiful supply, there will be a decided increase in production and marked improvement in the quality of all products manufactured.

SOME PROBLEMS CONFRONTING THE EAST

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POWDERED MIXES

Ice cream mix, complete except for flavoring, is becoming increasingly available in powdered sterile form. These powders, merely on incorporating water, yield mixes of standard fat, serum solids, sugar, and stabilizer percentages.

Powdered mixes have stimulated freezing equipment installations by soda fountains and roadside stands. Powdered mixes have brought back into use small freezing equipment made idle when limitation orders decreased the ice cream mix manufactured during wartime. Such mixes permit freezer operators to be stocked against heavy and unusual demands when liquid mix is used the plant supplying it is usually not in a position to ship promptly enough to take care of emergency requirements.

The small freezing units are generally accompanied by hardening cabinets and frequently by 'tempering boxes', though many roadside stands and retaurants omit them because other 'above freezing' refrigeration facilities are available.

A mix must be cold, preferably between 30° and 35° F., before it is placed into the ice cream freezer to obtain a product of satisfactory texture and body. Warm water disperses the mix powder more efficiently than cold but takes longer to cool to freezing temperature.

Since mix powders are hygroscopic, they are generally purchased in tins which make only enough for four to ten freezer batches; most users are discouraged from ordering bulk-packed mix powders after noting the 'caking' of powder in opened containers.

Single freezer operators are dependent on the weather to a greater degree than the larger ice cream plants since their mix tempering and ice cream hardening facilities are more limited. 'Freezer Fresh' ice cream is a favored feature. The unflavored, tempered mix must be 'ready'. A few days of inclement weather may find the operator with a cabinetful of tempered mix, and the lack of opportunity to freze it because of a hardening box which is also full.

To stimulate sales, a variety of flavors is kept on hand. One tin of powder, enough for a number of batches, may be used to prepare single freezer batches of a half dozen flavors. Flavoring materials are more economical when purchased in sizes large enough for a few batches. The opened flavoring containers are customarily stored in the 'above freezing' compartment until the contents are used up. The pH of fruit flavors favors mold growth on the surfaces if the flavoring is not utilized promptly.

THE CONTROL ASPECT OF ICE CREAM FROM POWDERED MIXES

Let us assume that the commercial mix powder in the sealed container is sterile; let us assume further that the dilution water is sterile. The reconstituted mix is just as good a growth medium for microorganisms as any other ice cream mix.

In developing control systems for dairy products we have tried to impress milk producers with the need for rapidly cooling the milk from all cows, even the healthiest; we may not have

used the terms but we have pointed out that the mammary is a modified ectodermal gland; that as such, it can be expected to harbor staphylococci; that these organisms, permitted to grow in a medium containing carbohydrate and protein, will form enterotoxin which is not destroyed by pasteurization heat and will yield gastroenteritis—whose symptoms become more violent in the younger human user.

In our restaurant and bakery sanitation codes we have required the boiling of cream and custard type puddings and fillings, careful handling of the freshly boiled materials, and prompt refrigeration of the completed articles. We have warned against the extended storage of salads, stuffings, etc. because of their carbohydrate and protein content. We have arranged food handlers' courses to teach the elements of 'safe' food production and handling. We have been stymied by the flash outbreaks of gastroenteritis brought on by picnics and socials where foods, prepared in homes beyond reproach from the domestic aspect, have become dangerous through the extended growth of these staphylococci—recoverable from anybody's skin.

It has taken years to get some large ice cream plants to the point of bringing vanilla and chocolate bulk-packed products to market in a satisfactory coliform-free condition. It will probably take more years before the fruit and nut-flavored bulk and the various packaged products reach the same status. We want to achieve this goal, since if a processing temperature high enough to inactivate staphylococcus enterotoxin is used, the absence of coliforms or their presence in only limited number, indicates that enterotoxin-forming staphylococci have not been reintroduced either and the health-promoting characteristics of dairy protein, carbohydrate, fat, and minerals will not be accompanied by health-retarding symptomology.

The powdered mix in the household size package may be a boon to the busy mother, but the "commercial size" is destined to complicate dairy products control.

Any milk producer knows that it is stupid to try to cool milk by merely letting a can sit in air; the milk in the center of the can would go sour. "Souring" organisms would be absent in the lukewarm mix made from sterile powder; staphylococci introduced by careless handling or careless washing would not. The slow cooling of the can of mix would give the staphylococci opportunity for luxuriant growth. Their metabolism would not be inhibited by the competitive lactic flora—and you can't taste enterotoxin.

In a single day, one counter freezer operated continuously might make twenty or thirty batches of ice cream, and the bacterial characteristics of each of the batches might be completely different because of the tempering intervals involved after dispersing the mix powder and the flavoring materials employed.

If we consider the limited ice cream control programs of even our advanced municipalities, it is clear that present approaches will not insure satisfactory products to consumers. It is time to examine the reasoning which led to the present system.

DAIRY PRODUCTS CONTROL DEVELOPMENTS

When the milk, cream, and ice cream sheds were defined by the municipality limits (when ice cream was a sweetened flavored cream stirred until frozen) and families gave up their cows to buy dairy products from nearby farms, the taxpayers appointed representatives to visit the farms to see that only products from "decent" places were permitted to enter the market.

When a farm supplying one munici-

pality began supplying another, it came under a dual inspection. When farmers began selling their milk to processing plants, more municipalities became involved. Each individual municipality attempted its own control program.

Uniformity of regulations and interpretations were, of course, impossible; the municipality of 5,000 population could not afford to implement a system constructed for an area of 500,000.

Science established that the quality of products could be measured by much more critical methods than visual inspection of production and processing facilities; but the dairy products control program of even some of our largest municipalities and states do not yet go beyond this.

What is most remarkable is that one of the governmental agencies recognized that in dairy control, the consumer (through his representative—the government) was attempting to render a service which in the case of less perishable food commodities, was always regarded as the merchandiser's responsibility, namely, that the burden of proving that his wares are suitable for market rests on the merchandiser.

With further development of urban areas, farms adjacent to them were assessed at higher land values than those at some distance. Transportation costs from distant points offset the higher taxes to a degree but milk produced at nearby farms went primarily into fluid milk channels while that from distant points went into cream and other products.

If cream is not processed at a temperature high enough to inactivate staphylococcus enterotoxin, it is obviously as potentially dangerous as milk with a history of similar production and handling. The practice of dividing cream into products for "fluid" and "manufactured" utilization grew on the assumption that the cream for manufacturing would be processed at the higher temperatures.

Farms located at the greatest distances from market had no choice but to have their milk converted ultimately to butter and other products where processing sublimated the characteristics of the raw materials quite completely. Municipalities did not even attempt to inspect farms located in the area from which such products were drawn.

While some advanced municipalities demanded that the merchandisers of milk and other dairy products prove that the raw supplies adhered to certain definite standards before being utilized and that the finished materials also subscribed to definite levels, the law of supply and demand was ignored. These municipalities were able to provide their consumers with fully satisfactory products when surpluses forced the industry to compete for markets. When supplies went short, however, these same municiaplities were forced to accept merchandise which admittedly did not meet regulations because no common floor covered the codes of adjacent areas and the first requirement of the agency under pressure was to get products, regardless of quality.

At the fringe of the milk shed, the cream producers entered the milk market when supplies were short; in the same way, producers for the butter market entered the cream zone. The drastic increase of the milk shed brought on by the war influenced other areas as well.

Before the war, the ice cream shed might have been considered the world —Danish, Argentinean, and Australian butter were regularly imported for utilization by the ice cream industry as well as for table use by consumers. The transportation differential never made it profitable to ship cream from these lands. (If it had, probably some municipalities would have sent their inspectors to examine the foreign farms.)

THE PRACTICAL SOLUTION

Years of experience have established that regardless of the state of the market, it is the condition of the product as it reaches the consumers that is important; that pathogens, the flora of udder infection or of diseased handlers and readily inactivated by pasteurization are less significant in milk for pasteurization than enterotoxin; that where definite control of fluid milk production and processing is not practiced, the products must be submitted to high enough heat treatment to inactivate enterotoxin, as well as pathogens, then kept uncontaminated in any way until they reach consumers.

The size of the milk shed alone makes it impossible for municipal or even state governments to check on the efficiency of the control systems maintained by producing and processing organizations; only a system country wide in scope and fully standardized to provide a definite quality floor, could function. Such a system, if advocated by individual government agencies, would break down in "short" periods just as its predecessors did. A system, to be practical, would have to be established and maintained by an organization in which industry and government (consumers') representatives cooperate.

Temperatures adequate to inactivate enterotoxin positively would destroy the cream line and alter the flavor, so that to continue fluid milk as we know it, supplies for that product would have to meet more stringent standards than that for others. The merchandisers would have to provide data developed by units they operate and to be licensed and supervised by the industry-government agency to establish the adequacy of their products at various stages, as well as at the final point, before being permitted to enter the market.

The calibration methods would have to be made definite and really employed. Personnel would have to be fully qualified and subject to definite supervision. L. H. Black's report on "official" control laboratories shows that even at this plane the lack of equivalent resources and the absence of standardization have resulted in completely ineffective work.

If merchandisers are made uniformly responsible for the caliber of their products, regardless of where marketed, the large ice cream plant whose products may be distributed in several states, will be forced by the regulation floor to improve those items which have been ignored up to now. The practice of manufacturing a large assortment of varieties would be discouraged. These are never subjected to official scrutiny at present because the limited facilities of health departments permit examination usually of only the fastest moving staples. The small powdered-mix, single freezer installation would have to meet the identical standards.

The dairy industries and consumers would both benefit tremendously by this method of control. The variable demands of different health departments through overlapping jurisdictions have discouraged the industry from repeating their requests for standardization, they will continue to assume that anything permitted to enter an area as human food is safe and health promoting. Raw milk availability in many markets shows how ridiculous is this assumption.

THE MIX INGREDIENTS

When the federal government revoked its set aside orders, milk which entered powder channels was attracted to the cream market instead of returning to butter use from which it was drawn originally by the government price policy. O.P.A. policing kept butter manufacturers from competing for these "liberated" supplies. Cream was short, and ice cream manufacturers had just been released from their limitation orders. While the laws of most states require that the cream used for the ice

cream mix would be of "fluid grade", a review of cream shipments of last year will show that if government agencies attempted to control quality, industry pressure soon discouraged them.

It is no wonder, then, why milk and cream producers and processors have come to the conclusion that government controls up to now have fluctuated with supply and demand. Because of the pricing situation more ice cream was made last year using cream than during preceding periods.

It is particularly grotesque to find that many of the health departments which did not object to substandard cream going into either their fluid or ice cream channels denied the use of butter oil to ice cream plants. This latter product is a fat concentrate in which processing eliminates flora that require moisture for their metabolism and also undesirable materials which are water soluble.

Milk, cream, and condensed skim milk are only some of the ingredients which may be used in ice cream manufacture. From the chemical aspect, except for sweetening, flavoring, and stablizing materials, the solids should come from dairy origin. The sterile protein of washed curd is as desirable as c.p. edible casein, and from the nutritional angle more desirable than the same protein from a poor condensed skim milk. A review of present dairy products formulae shows that fat can be supplied through cream (fresh, frozen, sweetened, or concentrated plastic), butter or butter oil, or whole condensed (fresh, frozen, sweetened) milk or powder. Protein can be derived from equivalent forms; even washed curd prepared during flush seasons and frozen until use has been employed successfully.

An ice cream mix derived entirely from "fresh fluid products" will certainly cost more than one made entirely from concentrates prepared during flush seasons. Our ice cream labelling laws should possibly demand for the consumers' economic protection the clear identification of the materials and the formulation employed; but from the health aspect, what must be demanded is the inactivation of enterotoxin by processing methods, regardless of the source of ingredients and the prevention of any contamination following that heat treatment.

The utilization of protein from other than whole or skim milk concentrates will make more nutritious ice cream available. The lactose concentration is what limits the quantity of dairy protein which may be incorporated into the ice cream mix.

When lactose percentages exceed certain limits the product becomes 'sandy'. Nutritionists will confirm that the prime value of dairy products lies in the concentration of tryptophane and other essential amino acids present in casein. Why not, then, permit washed curd as a satisfactory ice cream ingredient to the consumers' definite benefit?

In order to increase mix solids, the practice has developed of adding to the mix materials not yet classiled as fillers. Thus, while starch is definitely frowned on and stabilizers are not permitted beyond the 0.5 percent level, and vegetable proteins are considered adulterants, sugars, instead of representing merely the sweeteners (sucrose, dextrose, invert, and maltose) now include hydrolysis products—dextrins and dextrans—whose sweetening properties are insignificant.

Ice cream manufacturers vary their mixes depending on market conditions. Ice cream technology has elevated pasteurization temperatures primarily to accommodate the use of recently developed stabilizers. The range has has been reached by some plants already where enterotoxin is automatically inactivated. But what health department has attempted to check the holdover practices at even milk plants?

Certainly, checking the storage methods at large ice cream plants or the powdered mix freezers is beyond the ability of the municipal departments.

Eggs in fresh, frozen, and powdered form are accepted constituents of the ice cream mix. Egg products in powdered form whose solids are only partially derived from eggs now are available to the industry. The non-egg materials are not clearly defined as to their origin or percentage. When milk solids or sweeteners are not the egg diluents, these egg products may introduce solids beyond the legal definition of ice cream. Possibly this committee can form a unit to check on the acceptability of such materials.

MIX PROCESSING

The past few years have brought no drastic changes to basic processing. The old style permanent piston packing homogenizer has largely been replaced by the sanitary head models. Low pressure machines and sonic vibrators developed a number of years ago but have not yet been accepted to very great extent by the industry. Butter and butter oil mix processing have generally necessitated the use of higher speed agitators in pasteurizer vats; in some plants the butter is processed to a cream by a step-homogenization and check-valve system. Since in ice cream plants homogenization usually follows the pasteurization process, many plants have, to insure the non-introduction of coliforms from homogenizers, arranged to circulate the hot mix through the homogenizer and back to the mix tank for five minutes before directing it over the cooler.

Pasteurization temperatures were elevated as noted above. to take advantage of the newly developed stabilizing materials. Elevations as high as 180°F. for thirty minutes are commonly employed by many large installations. Such temperatures can be expected to affect staphylococcus enterotoxin appreciably.

Plate equipment for regeneration and cooling has not come into great use in ice cream plants as yet. The viscosities of stabilized ice cream mixes of 35 percent or higher solids has led to the assumption that plate equipment could not handle such materials efficiently, but some plants have found this type of equipment particularly advantageous because of its regeneration features. Some installations employ surface coolers for the final temperature drop.

Refrigerated storage tanks are rapidly becoming prominent, and by maintaining a storage temperature in the range of 30°–35°F., bacterial development is retarded quite completely.

With respect to the mix powder users, when they have been taught the essentials of cleaning and sterilizing and of proper refrigeration practice, very satisfactory products have been obtained. Some have installed "wet boxes" of the type used by dairy farmers for tempering the prepared mixes. Others have set cans of mix into tubs containing ice and water. These methods are not satisfactory, unless stirring or agitation is employed, until the mix has been reduced to the desired temperature.

The claims of sterilizer manufacturers continue to bewilder. Too few disclose that adequate cleaning must precede the successful use of the most potent preparations. If an equipment surface has not been cleaned completely, only heat is fully reliable as a sterilization agent.

In conjunction with the sterilizers, too few regulatory agencies recognize the variation of activity of hypochlorites buffered at different levels. The quaternaries, too, have limitations, and should not be accepted as a substitute for cleansing agents and elbow grease.

Our Committee was formed to promote the consumers' welfare, and we can be of greatest service by focusing attention on the problems discussed above to accelerate the development of

a uniform, country-wide, industry-maintained, and industry-government policed, practical control system which, by permitting only satisfactory products to come to market, will give consumers the nutrients and high degree of sanitary protection that they are entitled to.

REGULATORY CONTROL OF FROZEN DESSERTS

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Laws dealing with the control of frozen dairy desserts have been on the California statutes for several years, ever since the first requirements covering dairy products were drawn up. It was not until 1927, however, that ice cream and similar frozen products came in for specialized legislation, having to do with requirements pertaining to quality, food value, composition, and sanitation. At that time the legislature passed laws setting a bacterial limit on frozen dairy products requiring ice cream to contain 1.6 pounds of food solids in each gallon, and raising the annual factory license fee of one dollar to the minimum of twenty-five dollars. The legislature not only set up the new and almost revolutionary ice cream standards, but through a license fee provided funds to carry out the enforcement of the standards. Credit for raising the fees sufficient to enable proper enforcement goes to the ice cream industry which requested such legislation and proper enforcement. The funds were sufficient to provide for the services of two full-time men who devoted their time to this program. As the number of ice cream manufacturers increased and the volume increased it was possible to double the personnel and at present four men are employed in ice cream control work in addition to the clerical and laboratory staff.

LEGAL STANDARDS

California thus became one of the first states to adopt a bacterial standard for frozen desserts and to require a definite amount of food solids in each unit of frozen dessert. The food solids standard indirectly controls the amount of air or overrun permitted in ice cream. I believe California was also the first state to establish a statewide comprehensive system of control work pertaining to frozen desserts. The entire program is patterned after the market milk control program, which has developed into a comprehensive program.

The problems which attend the production of quality frozen desserts differ somewhat from those having to do with market milk quality, but there are certain fundamentals common to both products which form a basis upon which to build a constructive frozen dessert control program.

Our first task was to work out a suitable technique for making bacteriological determinations since no standard method existed at that time. Bacteria in milk is reported on the milliliter basis, but this method was not adaptable to ice cream with any degree of accuracy. By a series of tests it was determined that a milliliter of ice cream weighed as much as 1.0553 grams and as little as 0.7804 gram. Therefore, when the bacterial standard was adopted, the gram was used as a basis and not the milliliter. Our first bacteria standard on frozen desserts was 150,000 per gram maximum. The standard has since been reduced and is now 75,000 per gram. Special equipment has been devised by our laboratory staff for weighing the one gram charges.

At this point it might be well to provide a table giving the legal standards on frozen desserts in California. The standards listed in table 1 are now in effect with the exception of the standards for food solids per gallon, which, as a wartime measure, have been re-

duced to 1.4 pounds per gallon for ice cream and 1.1 pounds per gallon for ice milk. The minimum milk fat content for plain ice cream has been reduced to 8 percent.

Ignoring for the time being the war-time standard, ice cream is required to contain 1.6 pounds of solids in each gallon. This figure is determined by multiplying the percentage of total food solids by the average weight of ice cream. For instance, if several quarts of ice cream were weighed and found to average 4.5 pounds per gallon and the laboratory analysis showed the product to contain 36 percent total solids, the ice cream would contain 1.62 pounds of total food solids per gallon. This standard is rather unique in that it combines the features of a minimum weight standard with a total solids standard. Therefore, an ice cream with a high milk fat and food solids content may weigh less per gallon and still meet the requirements, whereas ice cream with a lower percentage of food solids must weigh more to meet the standard. For example, an ice cream with 40 percent food solids would only need to weigh 4 pounds per gallon, while one with 36 percent of food solids must weigh 4.5 pounds per gallon to meet the standard.

While the operation of this standard has done much to bring about an improvement in the texture, body, and weight of ice cream, we still receive complaints from consumers who do not understand how the standard works. Some consider only the weight of ice cream when making a purchase and give no thought to its richness and food solids content. Naturally in the absence of proper standards the weight can be made up with water or other ingredients having no food value. After all, the food value is the thing that counts and the one factor that determines the true value of the product. Without this standard there would be no limit on the amount of air that unscrupulous manufacturers may incorporate into ice cream.

Since the milk fat requirement is an old established standard, it probably is not necessary to comment upon its im-

TABLE 1

LEGAL STANDARDS FOR FROZEN DESSERTS IN CALIFORNIA

Product	Milk fat	Bacteria count	Stabilizer	Fruits	Nuts	Food solids per gallon	Eggs	Acid as Citric
Ice cream (plain)	10%	75,000	Not over 0.6 of 1%	...	...	1.6 lbs.	...	...
Ice cream (fruit)	8%	75,000	Not over 0.6 of 1%	3%	...	1.6 lbs.	...	...
Ice cream (nut)	8%	75,000	Not over 0.6 of 1%	...	1%	1.6 lbs.	...	...
Ice cream (French or custard)	10%	75,000	Not over 0.6 of 1%	...	...	1.6 lbs.	5 doz. Yolks	...
Ice cream mix	10%	75,000	Not over 0.6 of 1%	...	...	...	to 90 lbs. Mix	
Ice milk	4%	75,000	Not over 0.6 of 1%	...	...	1.3 lbs.	...	...
Ice milk mix	4%	75,000	Not over 0.6 of 1%	...	...	...	... ...	... ...
Sherbet	Less than 4%	75,000	Not over 0.6 of 1%	10%	...	...	...	.2 of 1%

portance or necessity. Milk fat has been the yardstick for measuring the value of dairy products for years. It is an expensive ingredient and one most likely to be curtailed in the event of a price war or during periods of intense competitive activity. No one, therefore, can question the wisdom of a milk fat standard for frozen desserts. Milk fat also influences to a great extent the quality of frozen desserts. The industry realizes this fact, and to their credit it must be said that frozen desserts with a few minor exceptions contain milk fat in excess of the minimum required by law.

SAMPLING PROCEDURE

When the frozen dessert control program was started it was necessary to devise methods for taking samples and equipment for keeping the samples frozen until they reached the laboratory. Naturally a bacteria count would be of no value on a sample which was allowed to become warm from the time it was taken until it arrived at the laboratory. A two-ounce screw cap bottle has been adopted for samples of frozen desserts. These bottles are fitted with a metal screw cap, lined with a pulp and oil board gasket which is replaced after each use. The bottles, caps, and gaskets attached tightly are sterilized in a hot air oven in accordance with the requirements set forth in *Standard Methods for the Examination of Dairy Products.*

In taking samples in the field, the inspector sterilizes a spatula (a one piece, stainless steel, steak knife, ground square across the point in the shape of a chisel, makes a good instrument) by flaming over an alcohol lamp. The top one-half inch or so of the product to be sampled is removed and the bottle filled. This is enough sample for bacteria, milk fat, and solids determinations. After the sample is taken, the cap is placed tightly on the bottle and an identification label giving essential information is attached. The bottles are then sealed and placed in an insulated shipping case. These shipping cases are similar to those used for transporting frozen desserts by express or baggage to distanct places. Three brine pads (metal discs about 1½ inches thick with diameter to fit the case) are frozen and placed in the case. Two pads are on top and one pad on the bottom of the container with two layers of sample bottles in between. Each night the inspector removes the samples and brine pads from the case and places them in a subzero hardening room. This freezes the brine in the pads solid and prepares the case for use the next day. When a full case of samples is obtained (54 samples), it is shipped by express to the laboratory for analysis. These shipments are timed so that they leave in the evening and are delivered at the laboratory in Sacramento not later than the afternoon of the following day. These shipping cases when fitted with three, well-frozen brine pads, will preserve the samples in a frozen condition for twenty-four hours or more even under the most severe summer weather.

SAMPLING FOLLOW-UP

When the inspector takes the sample a specially devised laboratory description blank is used to identify the bottle and its content. These blanks are arranged in a series of three copies, that is, an original, duplicate, and triplicate. There are single service carbons attached so that any information written on the original automatically registers on the other two copies. It also has a work sheet attached for the purpose of providing space for the bacteriologist and chemist to record their mathematics. Also attached by means of perforations are three labels which are easily torn out and attached to the sample bottles. Each label, description blank, and work sheet contain identical numbers which identify the sample

in line with the description blank and work sheet. Space is provided on the blank for the inspector to indicate what the sample is to be tested for, that is, milk fat, solids not fat, bacteria, etc. After the inspector has taken the sample, he signs the description blank and has the factory operator or interested party sign it also. The blanks are then forwarded with the samples to the laboratory. The laboratory personnel who take part in making the determinations, as well as the Chief of the Bureau, sign the reports after tests have been recorded. The original is filed at the headquarters office, the duplicate goes back to the inspectors who took the samples, and the third copy goes to the plant operator if he requests a copy.

When the results of tests on samples are received by the inspector, he reviews them and studies those which indicate the product failed to comply with standards. He then prepares to take whatever action as may be indicated and necessary to bring about compliance. In many instances this calls for follow-up work. In case of a high bacteria count, a general inspection of the factory is made which, among other things, includes checking on the methods of cleaning and sterilizing equipment; checking recording thermometers for temperature, accuracy, and holding time; checking the temperature of the mix as it comes off the cooler; checking the storage temperature and the length of time mix is held in storage; checking the ingredients used in the manufacture of the mix; and other items which may contribute to a high count. The sterility of the equipment is determined by the swab test, and each inspector is equipped to make these determinations. Many of our inspectors make swab tests as a matter of routine as well as for checking the cause for excessive bacterial contamination. The rinse test is used on containers. This consists of the introduction into the container of sterile water containing enough sodium thiosulphate to counteract the action of any chlorine which may be present and following the standard procedure of shaking the rinse water around the container. The samples of rinse water are sent to the laboratory for plating. Quite frequently when looking for the cause of high bacteria counts, the inspector takes samples of the mix and the frozen product at each different phase of the processing operation. The information thus obtained is helpful in determining which piece of equipment or which process is faulty. Ingredients which are added to the freezer after the mix has been pasteurized (the California law requires the pasteurization of all milk and milk products used in frozen desserts), such as fruits, nuts, and flavors, are frequently sampled to check on their quality.

Any deficiency in milk fat content is carefully checked to ascertain if possible whether the illegal test is the result of carelessness, deliberate or accidental. In checking milk fat deficiency, the inspector must have the ability to make mathematical calculations and figure formulas to see that they are correctly balanced and will meet legal standards. It often becomes the inspector's job to teach factory operators how to calculate and proportion a batch of mix.

Samples which show a food solids content below the legal requirement are followed up in the same general manner as outlined for a low milk fat product. Since, as previously explained, this standard combines a weight and total solids content, it is necessary to check on the foods solids content. Some of these calculations and investigations have brought to the plant operator's attention the importance of checking the weight of the finished product. Very often the difference of a few ounces of ice cream in each gallon is the factor which decides between success and failure.

ICE MILK

Ice milk as defined by the California law is a frozen dessert similar to ice cream but containing less milk fat and less food solids per gallon. Its principle use is in the form of chocolate-coated bars usually on a stick and to take the place of ice cream in the preparation of fountain drinks, such as milk shakes. The same problems encountered in the control of ice cream are applicable to ice milk, and the enforcement program is carried out in a similar fashion. Ice milk, because it is almost indistinguishable from ice cream in appearance, finds its way into the hands of retailers who attempt to substitute it for ice cream. It therefore becomes necessary for the inspectors to make purchases from suspected retailers of frozen desserts to determine if ice milk is being substituted for ice cream. To safeguard the public from misrepresentation, ice milk sold in packaged form must be labeled with the words "Ice Milk". A popular use for ice milk is the so-called "frosted malt" or "frostie". This is simply an ice milk mix flavored with a variety of extracts, chocolate and malt, frozen to a semi-hard condition, and dispensed directly from the freezer into cake cones or cups. When the words "frosted malt" or "frostie" appear in connection with the labeling and advertising of ice milk, the words "ice milk" are required to appear along with such trade terms or trade names.

Sherbets in California are required to contain at least 10 percent of fruit or fruit juice. Any milk or milk products used must be pasteurized and there is a limit of 75,000 bacteria per gram. Sherbets must be so labeled. To prevent the misrepresentation of sherbet as ice milk, its production is confined to fruit flavors and a definite percentage of fruit acid is required.

LICENSING PROCEDURE

Every manufacturer before engaging in the business of manufacturing, freezing, or processing frozen desserts must apply for a factory license. Upon receipt of the application, properly filled out to give the required information, an inspection is made of the factory and if found satisfactory a license is issued. The factory is required to have floors of nonabsorbent materials, such as tile or cement, properly sloped to a trapped drain; walls of nonabsorbent material high enough above the floor to take care of any splash; and surface of walls and ceilings are to be sound and cleanable. Each factory must have adequate lighting and ventilation, running water, washing and sterilizing facilities, flyproof toilet, and laboratory facilities, and must score at least 80 percent on the milk products plant score card. These requirements apply to all factories regardless of their size and includes hotels, restaurants, boarding houses, and hospitals manufacturing frozen desserts. The so-called counter freezer installations are subject to the same requirements. Any one interested in installing a small freezer may secure a set of blue prints from our office giving details of construction and arrangement. These blue prints and plans have served as a very helpful guide to small freezer operators. Not only does the law require a factory to score 80 percent before operation, but it also makes it unlawful to operate a milk products plant which scores less than 80 percent. A sample of the score card is attached.

This score card was designed so that it can be used for all factories regardless of size and products handled. In using the score card for small frozen dessert factories where all the mix is purchased, such items as vats, cooling facilities, sanitary pipes and fittings, thermometers and charts, and transportation vehicles are stricken from the card; whatever value these items carry is deducted from the amount allowed for perfect score. This feature has made the score card flexible so as to be

MILK PRODUCTS PLANT SCORE CARD

STATE OF CALIFORNIA, DEPARTMENT OF AGRICULTURE, SACRAMENTO
DIVISION OF ANIMAL INDUSTRY—BUREAU OF DAIRY SERVICE

Trade Name..... Owner or Manager.....
Town..... Business Address.....
Products Manufactured or Processed.....
Factory License No..... Date.....
Inspection Made: Before, during, after processing. (hour) ..... M.

ITEM NUMBER		PERFECT SCORE A	ALLOWED B
1.	**LOCATION:** Surroundings clean 1; sanitary 4; orderly 1; attractive 1	7	
2.	**ARRANGEMENT:** Rooms—adequate number 4; size 4; convenient 2; attractive 1; shafts, pulleys, pipes, ledges, clean 2	13	
3.	**FLOORS:** Smooth 4; sound 5; properly sloped to trapped drain 5; non-absorbent 5; clean 4	23	
4.	**WALLS:** Sound 4; smooth 4; light color 1; non-absorbent 4; clean 4	17	
5.	**CEILINGS:** Sound 2; smooth 2; proper height 4; light color 1; clean 2	11	
6.	**DOORS, WINDOWS:** Screened (or protected) 5; good repair 2; doors open out and self-closing 3; clean 2	12	
7.	**LIGHT:** Adequate and evenly distributed 4	4	
8.	**VENTILATION:** Adequate and evenly distributed 5	5	
9.	**WATER SUPPLY:** Clean 2; approved source 5; sufficient outlets 1; hose satisfactory 1; abundant 1	10	
10.	**TOILET:** Good repair 1; vestibuled 1; ventilated 1; self-closing door 1; lavatory 1; soap 1; towels 1; clean 2; fly proof 1	10	
11.	**DRESSING ROOM:** Clean 2; ventilated 2; orderly 1	5	
12.	**HAND WASHING FACILITIES:** Wash basin 1; convenient 1; warm water 1; soap 1; towels 1; clean 1; sufficient 1	7	
13.	**COLD STORAGE ROOMS:** Proper construction 4; free of odors 2; proper temperature 1; clean 3	10	
14.	**WASTE DISPOSAL:** Sewer facilities 5; covered waste containers 2	7	
15.	**WASHING FACILITIES:** Wash tanks 2; condition 1; sufficient brushes 1; suitable 1; adequate 1; washing powder 1; clean 1	8	
16.	**STERILIZING FACILITIES:** Adequate 5; efficient 5; convenient 1; temperature indicators accurate 1; clean 2	14	
17.	**CONTAINERS:** Smooth 1; no open seams 2; rust-free 2; clean 5; sterilized 5; dried 5; protected storage 1	21	
18.	**VATS:** Smooth 2; tight surfaces 4; free of exposed copper or rust 2; proper covers 2; clean 5; sterilized 5; dried 5	25	
19.	**COOLING FACILITIES:** Adequate 2; smooth 1; sound surfaces 2; free of exposed copper or rust 2; clean 5; sterilized 5; dried 5; protected 2; proper temperature 5	29	
20.	**SANITARY PIPES, FITTINGS AND PUMPS:** Proper type 1; smooth surface 2; free of dents 2; free of exposed copper 2; flush type valve 3; leak detector type valve 2; clean 5; sterilized 5; dried 5; protected 2	29	
21.	**THERMOMETERS:** Approved type of mounting 3; accurate 5; sufficient 3; indicating thermometer 3	14	
22.	**THERMOMETER CHARTS:** Proper 2; correctly recorded 3; filed 2	7	
23.	**OTHER EQUIPMENT:** Adequate 2; good repair 7; clean 5; sterilized 5; dried 5; protected 2; (underline equipment examined) freezer, homogenizer, churn, separator, bottler, weigh tanks	26	
24.	**PROTECTION OF PRODUCT:** From contamination 5, (flies, dust, odors, vermin, water); proper delivery temperature 2	7	
25.	**EXPEDITIOUS OPERATION:** Celerity and dispatch 2	2	
26.	**LABELING:** Of products—Legal 2	2	
27.	**LABORATORY CONTROL:** Satisfactory 4	4	
28.	**PERSONNEL:** Sufficient 1; clean habits 10; clothing 2	13	
29.	**TRANSPORTATION VEHICLES:** Protected 1; clean 1; attractive 1; legal signs 1	4	
30.	**STORAGE OF SUPPLIES:** Clean 2; orderly 1; properly protected 1	4	
	TOTAL POINTS	350	
	PER CENT		

Draw line through items in Column A which do not apply to this Milk Products Plant, and do not include such items in total for perfect score.

Duplicate copy received

Representative

DS FORM 30 57044 4-46 SM SPO

applicable to all processing plants. Each factory manufacturing frozen desserts is required to be scored at least once annually. Those falling below the required 80 percent are, of course, given additional scorings and instructions to correct the items which cause the factory to be substandard. It must not, however, be implied that only one inspection is made during the year. Only one score is required but several visits are made for the purpose of sanitary inspections and sampling of the products for analysis.

There are many provisions of the law pertaining to frozen desserts which do not receive much publicity and which are sometimes taken for granted. For instance, it is the inspector's job to see that all frozen desserts are properly labeled and that labeling and advertising do not carry misleading or deceptive terms. All packaged frozen desserts must be labeled with the name and address of the manufacturer, distributor, or retailer. Other miscellaneous enforcement problems include checking the quality of butter intended for use in the manufacture of such products; checking on the quality of eggs and egg products used and approving or denying permits for the use of eggs, egg products, or butter in frozen desserts; checking frozen desserts labeled "French" or "custard" to determine if the required amount of egg yolk solids is present (the law specifies at least 5 dozen egg yolks or equivalent in frozen or dried yolk to each 90 pounds of mix); checking and approving stabilizers, such as gums and gelatines for suitability in ice cream; checking products to detect any evidence of faulty or improper pasteurization; checking milk and cream for acidity; and other quality standards.

ENFORCEMENT PROCEDURE

There are three methods of bringing about compliance with laws dealing with frozen desserts, namely, prosecutions, hearings (where the plant operator is summoned to show cause why his license should not be revoked or suspended) and impounding any product suspected of not meeting legal standards. In the latter case if the analysis showed the product to be substandard, a hearing is held by the Director of Agriculture or some officer designated by him to determine the disposition of the products involved. The nature of the defect determines the disposition. The product is either ordered destroyed, permitted to be used as feed for poultry or livestock, or in some cases reprocessed for human consumption.

The California Department of Agriculture has been very fortunate in having the cooperation of the industry in its enforcement program. Manufacturers who have the interest of their business and the welfare of the consumer at heart realize the necessity of reasonable legislation. It is not only a protection to public health and general welfare, but also a protection to fraudulent and unfair competition. Fair and reasonable legislation has played its part in elevating the frozen dessert business to a high plane and common sense enforcement of laws will do much to maintain this reputation.

Committee on Frozen Desserts Sanitation:

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