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CHAPTER 43

ICE CREAM

Composition, Ice Cream, Milk Ices or Ice Milk, Soft Ice Milk or Ice Cream, Composition of Sherbets, Composition of Ices, Frozen Suckers, Making the Ice Cream Mix, Mixing and Pasteurizing, Homogenizing the Mix, Cooling and Holding Mix, Freezing Procedure, Refrigeration Requirements, Freezing Ice Cream, Hardening Ice Cream, Frozen Suckers and Ice Cream Bars, Refrigerating Equipment

TO be advertised and sold as ice cream, the product must meet the minimum standards set up as law in the various states. Other frozen desserts, or so-called ice cream substitutes, must be advertised and sold under names or brands which will not lead the purchaser to believe legal ice cream is being offered for sale. Under existing laws, the fat content of ice cream must be butterfat derived from milk, and in some cases the minimum amounts of milk solids are also specified. Frozen desserts using vegetable fat in place of butterfat, even though they meet all the requirements of fat and solids, cannot be sold as ice cream. In the following discussion of composition, the treatment is intended to refer to normal practices in the processing and distribution of ice cream.

The standards for ice cream of the various states are written chiefly in terms of fat content, with some states also specifying minima for either the total milk solids content or the milk-solids-not-fat (serum solids) content. The majority of states also control the amount of air in the product either by specifying a minimum weight per gallon, or a minimum weight of food solids per gallon, or a minimum volume after the air has been removed on melting.

The fat standards range from 8 to 14 percent for plain or vanilla ice cream. For ice cream flavored with the more bulky flavoring materials, such as fruits, nuts, and chocolate sirup, most states permit two percent less fat, to enable manufacturers to use one stock mix in making the various flavored ice creams. Accordingly, the minimum fat standards for fruit, nut and chocolate ice cream range from 6 to 12 percent.

COMPOSITION

Ice Cream

Milk fat or butterfat content determines the legal standards for ice cream. Where other ingredients such as eggs, nuts, cocoa or chocolate contribute fat, such fat cannot be considered as satisfying the legal minimum. The discussion of fat content is, therefore, solely in terms of milk fat or butterfat.

The minimum butterfat content is set at 10 percent by Federal standards which became effective July 1, 1961. Nearly all of the state standards conform or are in the process of legislative changes to make them conform to the Federal standard. It is common practice among manufacturers, however, to make two or more grades of ice cream, one a competitive ice cream with a minimum legal fat content, and the others of higher quality, being richer in fat and lower in overrun. To a limited extent ice cream is made with a fat content considerably higher than even the highest state standards by manufacturers who appeal to a special trade at premium prices. Such ice cream may be made with fat content of 16 or 18 percent, and in rare instances as high as 22 percent. Thus, if we include the extremes, the range in fat content is

from 6 to 22 percent, although the bulk of ice cream is made with fat content ranging from 10 to 12 percent.

Serum solids content is the term universally used in the ice cream industry to designate the non-fat solids from milk. The chief components of milk serum are *lactose*, the *milk proteins* (casein, albumin and globulin) and *milk salts* (sodium, potassium, calcium and magnesium as chlorides, citrates and phosphates). For the purpose of general calculations the following average composition percentages for serum solids are useful: lactose, 54.5; milk proteins, 36; milk salts, 9.5.

The serum solids in ice cream tend to produce a smoother texture, better body, and better melting characteristics. Usually serum solids are relatively inexpensive as compared with fat, and so the tendency is to use them liberally. The total solids content commonly is kept slightly below 40 percent, and certainly should not exceed 42 percent.

The lower limit in the serum solids content, 6 to 7 percent, is found in a home made type of ice cream where the only dairy ingredients are milk and cream. Ice creams with an unusually high fat content will also be kept near this serum solids content in order that the total solids content may not be excessive. Most ice cream, however, is made with the addition of condensed or powdered milk or skim milk in such amounts as to bring the serum solids content within the range of 10 to 11.5 percent. The upper extreme of 12 to 14 percent serum solids can be used only where sandiness is avoided by a rapid turnover or other special means.

The *sugar content* of ice cream is of special interest because of its effect on the freezing point of the mix and the hardening behavior of the ice cream. The extreme range of sugar contents encountered in ice cream is from 12 to 18 percent, with the range of 14 to 16 percent being most representative of the industry. The chief sugar used is sucrose (cane or beet sugar), either in granulated or liquid form. Many manufacturers use dextrose and corn sirup solids to replace part of the sucrose. Some manufacturers prefer sucrose in liquid form, or in a mixture with sirup, because of lower cost and easier handling in tank car lots. In some instances 50 percent of the sucrose content has been replaced by such other sweetening agents. A more normal practice is to replace from one-fourth to one-third of the sucrose by dextrose or corn sirup solid, or a combination of the two. The kind of sugar used, as well as the amount, is of interest in connection with the freezing characteristics of the product.

Practically all ice cream is made with the addition of a *stabilizer* to aid in maintaining a smooth texture, especially under the conditions that prevail in retail cabinets. The few manufacturers who normally do not use stabilizers offset this omission by a combination of factors such as a high fat and solids content, the use of superheated condensed milk to aid in smoothening the texture and imparting body, and a sales