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# An Overview on Ice Cream

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***ABSTRACT:*** ***Ice cream is a widely consumed dairy food by people of all ages. Ice texture is one of the most important elements in determining the product's commercial success. Ice cream is a dairy aerated treat that has been frozen before serving. It's a liquid and solid-phase microcrystalline network. It includes air cells entrapped in a liquid phase, as well as proteins, fat globules, stabilizers, sugar, and soluble and insoluble ions. It is a complicated physicochemical and colloidal system made up of numerous complex components that influence the structure of ice cream in both good and negative ways. Stabilizers and emulsifiers both enhance the texture of ice cream by increasing viscosity and restricting the movement of free water molecules, but too much of either may result in poorer melting and whipping ability. Controlling the balance of ice cream characteristics by preserving its structure, texture, and body is crucial. Fruit fiber, chunks, purees, pastes, and concentrates; milk and whey isolates and concentrates; egg, egg yolks, and their products; various flavorings, nuts, chocolate, probiotics, and yogurt are among the finest carriers. So far, maintaining its substantial composition and structure with a proper mix of components has been critical.***

***KEYWORDS: Fat, Ice Cream, Milk, Probiotics, Protein.***

## 1. INTRODUCTION

Ice cream is a frozen dairy product that is produced by agitating the ice cream mix before freezing it. It's made up of a variety of culinary components, including milk, sweeteners, stabilizers, colors, tastes, and egg products. Ice cream mix is an unfrozen combination of components that contains all of the ice cream ingredients except air and flavoring materials. The percentage of milk fat, milk solids not fat, sugar, egg solids, stabilizers (which are compounds added in very small quantities to strongly influence the formation and growth of ice crystals in the ice cream to render the product with desired body and texture), and total solids are all used to describe the composition of ice cream. Frozen desserts, which include ice cream, frozen custard, frozen confections, ice milk, sherbets, water ices, and mellowing goods, are categorized as frozen desserts[1]–[4].

Ice cream originated in Europe and was subsequently brought to the United States, where it grew into a thriving business. Ice cream is said to have originated from iced drinks and water ices. Ice cream was most likely brought to the United States by early English colonists. Baltimore, Maryland, developed the first wholesale ice cream business in the United States in 1851. New York, Saint Louis, Chicago, Washington, and Cincinnati all have ice cream factories. The advent of the pasteurizer and homogenizer, better freezers, and other preservation equipment, as well as the creation of condensed and dried milks, accompanied a gradual rise in the business until after 1900. In 1879, the ice cream soda was developed, followed by the ice cream cone and Eskimo Pie in 1904 and 1921, respectively.

### *1.1 Ice Cream Composition:*

Ice cream is often referred to be a "fun food," which it is not, and has even been referred to as "junk food." These depreciatory remarks have had a significant impact on industrial growth from its beginnings. Ice cream, in fact, is a well-balanced, nutritious, readily digested, and tasty meal. It's because ice cream is a nutrient-dense food that's often served to hospital patients as a meal component. Ice cream's energy and nutritional content are determined by the food value of the

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ingredients used to make it. Ice cream has four times the amount of carbs as milk. The milk products used in the ice cream mix include milk components, although in varying quantities. Personal preferences of company management or customer demands for flavor, body and texture, and color characteristics of the finished product, such as natural or fortified flavor with artificial flavoring; chewy to heavy, higher overrun; or more cooling body and texture characteristics, are some of the factors to consider when developing a formulation of satisfactory composition[5]–[7].

*1.2 Proteins in Ice Cream:*

Because they include all of the necessary amino acids, the milk proteins in ice cream have a high biological value. Essential amino acids like tryptophan and lysine are abundant in milk proteins. Proteins in the diet provide the amino acids needed for baby and child development, as well as tissue maintenance in adults. Milk proteins are not only known to be complete, but their absorption is also 5–6% more complete than that of other proteins in general. Milk proteins are also chemically superior and have high net protein utilization (NPU) values. A protein's chemical quality is evaluated by comparing its amino acid composition to that of hen's egg protein, which is used as a standard. Obtaining NPU values with a test animal like a man is tough, but with a test animal like a rat, it's very simple. Protein levels are determined based on nitrogen content measurements in the meal. Proteins were found to contain close to 16 percent nitrogen in early tests. The standard approach back then was to multiply the nitrogen content by 6.25, the protein conversion factor. The conversion factor for milk proteins is 6.38. The glycosylated proteins compress and smooth the ice cream, preventing it from having a weak body and gritty texture. Excessive quantities, on the other hand, result in a salty or cooked taste, as well as a soggy or sandy body and texture fault.

*1.3 Carbohydrates in Ice Cream:*

In all human diets, carbohydrates offer a substantial quantity of energy. Plants produce these from carbon dioxide and water, with oxygen liberated under the influence of sunshine. Sugars are the main byproducts, which provide a handy source of energy for the cells. Starch, dextrin, cellulose, pectin, gums, and other related compounds are examples. Various types of sugars may be used in the production of ice cream. Sucrose is the most frequently used sugar. It may originate from either cane or beet, since the two are chemically similar.

*1.4 Fat in Ice Cream:*

Fats contain a lot of energy. In ice cream, it is very important. It has a deep taste and acts as a transporter for additional flavor components, as well as promoting ideal textural characteristics. It's essential to utilize the right amount of milk fat in order to correctly balance the mix and meet regulatory requirements. Because milk fat is in the form of an emulsion and is not a genuine aqueous solution, it does not decrease the freezing point. It has the effect of slowing down the pace of whipping. High fat content reduces consumption, raises costs, and raises caloric value. A decent average ice cream is regarded to have a fat level of 12 percent. Fresh cream is the greatest source of milk fat. Frozen cream, plastic cream, butter, butter oil, and condensed milk mixes are some of the other options. Most animals' meals and storage depots include fats, mostly in the form of triglycerides. Saponifiable and nonsaponifiable materials coexist in milk fats[8]–[10].

*1.5 Minerals in Ice Cream:*

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For development and performance, a range of inorganic components are required. Major minerals or macronutrients are those that are required in large quantities, such as calcium, phosphorus, magnesium, sodium, potassium, and sulfur. Trace elements are those that are required in tiny quantities, such as copper, cobalt, iodine, manganese, zinc, fluorine, molybdenum, and selenium. The inorganic nutrients are interconnected and should be consumed in certain amounts. Because calcium and phosphorus are so tightly linked, they are of critical importance. The greatest sources of calcium, phosphorus, and other minerals in sufficient diet include milk and items like ice cream. Researchers have discovered that increasing the quantity of lactose in one's diet helps with calcium absorption. Because ice cream is high in lactose, it promotes the absorption of more calcium from the diet, which is essential for developing children and certain adults. Milk and ice cream have calcium levels of 0.118 and 0.132 g/100 g, respectively, and phosphorus amounts of 0.093 and 0.105 g/100 g, respectively. The minerals give the ice cream a slightly salty flavor that balances out the overall flavor.

*1.6 Vitamins in Ice Cream:*

Vitamins are organic compounds that the body need in tiny amounts for its metabolism but cannot manufacture in large enough quantities. These do not provide a significant contribution in terms of energy. There are two types of vitamins: fat-soluble and water-soluble vitamins. A, D, E, and K are fat-soluble vitamins; B1 or thiamine, B2 or riboflavin, B6, and B12 are water-soluble vitamins. Ice cream, like milk, is a good source of several important vitamins that are necessary for proper development and health. A short explanation of the most well-known vitamins may be useful in emphasizing the significance of milk and ice cream in one's diet.

*1.7 Fat-soluble vitamins in ice cream:*

*a. Vitamin A:*

This anti-infective vitamin may be found in abundance in ice cream (492 IU 100 $g^{-1}$). It's the most important milk fat vitamin. It is necessary for retinal development and proper function. Night blindness and follicular keratosis, a skin condition, are symptoms of its absence.

*b. Vitamin D:*

This antirachitic vitamin is found in small amounts in ice cream (4 IU 100 $g^{-1}$). Its absence causes a reduction in growth rate as well as reduced calcium and inorganic phosphorus levels in the blood. Fortified milk may be used to make vitamin D-rich ice cream.

*c. Vitamin E:*

Ice cream, which contains approximately 3 mg $kg^{-1}$ of this antisterility vitamin, is a good source. In laboratory animals, this vitamin aids in the maintenance of normal health and reproductive organs. All cell membranes contain this vitamin. It protects polyunsaturated fatty acids from oxidation and helps to avoid a variety of degenerative diseases.

*d. Vitamin K:*

This vitamin is required for the production of prothrombin, which clots the blood and prevents bleeding. Milk has a very low content of this vitamin, which is destroyed through pasteurization and evaporation.

*1.8 Water-soluble vitamins:*

*a. Vitamin $B_1$ (thiamine):*

This vitamin, which is necessary for optimal metabolism and health, is found in an average of 0.48 mg $kg^{-1}$ in ice cream, with a range of 0.38–0.65 mg $kg^{-1}$. Its lack produces beriberi, which is characterized by a lack of appetite, anxiety, fatigue, and irritability. It may induce neurological problems or cardiac dilatation in certain people.

*b. Vitamin $B_2$ (riboflavin):*

Riboflavin is a vitamin that people need in their diet. Ice cream has a significant amount of riboflavin, averaging 2.3 mg $kg^{-1}$ with a range of 2.0–2.6 mg $kg^{-1}$. Its absence results in eye and mouth lesions, as well as reddening of the lips.

*c. Vitamin $B_6$ (pyridoxine):*

It's a crucial coenzyme in the amino acid metabolism. Its absence may result in anemia, seizures, slowed development, and dermatitis. The average amount of this vitamin in ice cream is 0.0047 mg $kg^{-1}$, with a range of 0.0026–0.0078 mg $kg^{-1}$.

*d. Vitamin $B_{12}$ (cyanocobalamin):*

It is an anemia-prevention vitamin that is unusual among vitamins in that it is not present in any plants. The structure of this vitamin is the most complicated of all vitamins. It's a necessary metabolite for a broad range of species. The average amount of this vitamin in ice cream is 0.0047 mg $kg^{-1}$ with a range of 0.0026–0.0078 mg $kg^{-1}$. Its absence may result in anemia and spinal cord atrophy.

*e. Vitamin C (ascorbic acid):*

It's found in the tissues of many kinds of plants and animals. Fruits, fruit juices, and green leafy vegetables are all high in it. Scurvy is prevented by taking these vitamins, which function as an antiscorbutic component. This vitamin may be found in abundance in fruit ice creams. Ice cream has an average of 3 mg $kg^{-1}$ of this vitamin, with a range of 0–11 mg $kg^{-1}$.

*f. Stabilizers:*

Stabilizers are used in ice cream to avoid the development of big ice crystals that are unappealing. They have a high water-holding capacity, as well as the ability to prevent ice crystal formation in storage, provide product homogeneity, provide appropriate melting resistance, and enhance handling characteristics. Stabilizers have an indirect influence on taste. They increase viscosity, have little impact on freezing point, and reduce whipping ability in general. The quantity of stabilizers needed depends on the product's characteristics, the mix's solids content, the kind of processing equipment used, and other variables.

*g. Emulsifiers:*

Emulsifiers are added to ice cream to give it a smoother body and texture, as well as to impart dryness and enhance the mix's whipping ability. Monoglycerides or diglycerides, sorbates, and polysorbates are commonly used emulsifiers and are added at a rate of 0.1–0.4 percent of the final product. Emulsifiers may also be found in egg yolk solids. Excessive quantities of emulsifiers cause the product to melt slowly and have body and texture problems.

*h. Flavors:*

Flavor is often regarded as one of ice cream's most significant qualities. Because minor off-taste in the ice cream mix may obscure the delicate flavor of the flavoring material to be added, the kind of flavoring material has an impact on the quality of the ice cream mix. The kind and degree of flavor to be added is determined by the customers' local preferences. Ice cream flavoring may be done using both natural and synthetic flavorings.

*i. Colors:*

The color of ice cream should be delicate and appealing, and it should be easily linked with the taste. Chemicals are responsible for the majority of colors. Colors are offered in two forms: liquid and powder. Dry pigments are used by most ice cream makers because they are less expensive and may be dissolved in boiling water as required.

*1.9 Health Effects of Ice Cream:*

*a. To combat osteoporosis:*

Ice cream, for example, has 0.122 g calcium per 100 g. It aids in the development of strong and healthy bones. According to the Office of Dietary Supplements (ODS), the bones and teeth contain 99 percent of the body's calcium, which is needed to support function and structure. When the body does not get enough calcium on a regular basis, it may draw calcium from its reserves.

*b. In women's reproductive health:*

The experts firmly believe that ice cream is beneficial to women's reproductive health. According to a new study involving 18 000 women aged 24 to 42, eating ice cream improves the odds of ovulating. The research examined the eating patterns of the women who participated in the feeding experiments.

*c. Improvement of immunity:*

Ice cream, which is high in lactoferrin and cytokines, boosts immunity to a variety of illnesses, including influenza. Ironically, there is a widespread misconception that ice cream causes colds and coughs. When we consume ice cream, the melting ice cream that gets into our mouth is influenced by our body temperature, thus the ice cream temperature is no longer as low.

## 2. DISCUSSION

Ice cream is a dairy product that has been pasteurized, homogenized, aerated, and frozen to preserve a consistent consistency. It is a low-cost, healthful, nutritional, and tasty product. Sugar, fat, emulsifiers, stabilizers, water, egg and egg products, corn syrup, dextrose, and flavors make up ice cream's composition. In the end, it's a three-phase network made up of air, solid, and liquid. Ice crystals are entrenched in the liquid phase, whereas air cells are scattered. In the liquid phase, milk proteins, soluble and insoluble ions, fat particles, stabilizers, and sugars are all present. As a result, the physiochemical food system is very complicated. Frozen confections, water ice, sherbet, frozen custard, parevine-like items, ice milk, and mellorine are all included in the dairy frozen desserts category.

## 3. CONCLUSION

Ice cream is especially beneficial since it contains high-quality protein and calcium that is readily absorbed. It contains numerous nutrients and may contribute to a healthy and balanced diet's daily

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energy intake in a helpful and pleasant way. Consumer acceptability is critical to the future success of functional probiotic ice creams in the marketplace. The creation of probiotic ice cream is a top research goal for food designers, as well as a challenge for both the business and the scientific community. Ice cream, in particular, is an excellent vehicle for delivering probiotics to the human intestine. Consuming this frozen treat on a daily basis is another method to maintain high numbers of probiotic cells in the stomach. More research is required to better understand probiotic viability in the severe circumstances of ice cream formulation and production.

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