

# Lactose in food technology: Innovations and applications.

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## Introduction

Lactose, a natural sugar found in milk and dairy products, plays a significant role in food technology. With its unique properties and versatility, lactose has become a key ingredient in various food applications. **Properties of lactose** **Solubility:** lactose is highly soluble in water, which makes it easy to incorporate into liquid-based food products. This property allows lactose to dissolve and disperse uniformly, contributing to the overall consistency and texture of the final product. **Sweetness:** lactose has a mild sweetness that enhances the flavors of food without overpowering them. It provides a delicate and subtle sweetness that can complement other ingredients and flavors in a wide range of food applications. **Low hygroscopicity:** lactose has relatively low hygroscopicity, meaning it has a low tendency to absorb moisture from the surrounding environment. This property is beneficial in maintaining the texture and stability of food products, as excessive moisture absorption can lead to product deterioration, clumping, or changes in texture. **Bulking agent:** lactose can act as a bulking agent in food formulations. Its ability to add volume and bulk to food products helps create desirable textures and mouthfeel. It is particularly useful in applications where maintaining texture, such as in ice creams, yogurts, and powdered drink mixes, is important. **Flavor enhancer:** lactose has the ability to enhance flavors in food products. Its mild sweetness can bring out and balance other flavors, making it a versatile ingredient in various culinary creations. Lactose can help improve the overall taste profile of both sweet and savory foods [1].

**Applications of lactose in food technology-** **Dairy products:** lactose is naturally present in milk and is a crucial component in the production of various dairy products. It serves as a source of sweetness, contributing to the taste of products like ice cream, yogurt, and flavored milk. In addition, lactose is used as a bulking agent and texture enhancer in dairy desserts and processed cheeses. **Infant formula:** lactose is the primary carbohydrate source in most infant formulas. It provides a readily digestible energy source for infants and helps promote the growth of beneficial gut bacteria. Lactose-based formulas are designed to mimic the composition of human breast milk and provide essential nutrients for proper development. **Bakery and confectionery:** lactose finds application in the bakery and confectionery industry as a functional ingredient. It helps improve browning and enhances the texture of baked goods. Lactose also acts as a humectant, extending the shelf

life of baked products by retaining moisture and preventing staling. In confectionery, lactose is used as a filler, binder, and flavor enhancer in various candies and chocolates [2].

**Pharmaceutical and nutraceutical products:** lactose serves as an excipient in pharmaceutical tablets and capsules, providing bulk and aiding in the manufacturing process. It also acts as a carrier for drugs, ensuring precise dosage and controlled release. Additionally, lactose is utilized in the production of nutraceutical products, such as dietary supplements and functional foods, where it provides texture, sweetness, and a source of energy. **Sports nutrition:** lactose plays a vital role in sports nutrition products, particularly in the formulation of protein powders and meal replacements. It provides a carbohydrate source that aids in post-workout recovery and replenishes glycogen stores. Lactose also contributes to the desired creamy texture and taste of protein shakes and bars. **Flavor enhancement:** lactose acts as a flavor enhancer in various food products. It helps balance and amplify flavors, particularly in savory applications such as soups, sauces, and savory snacks. Lactose's subtle sweetness complements other flavors, making it an ideal choice to enhance taste profiles. **Dairy alternatives:** lactose is often used in the development of dairy-free and lactose-free products as a functional ingredient. It helps improve the texture and mouth feel of non-dairy alternatives like plant-based milks, yogurts, and cheeses. Lactose-free options cater to individuals with lactose intolerance while still providing a similar sensory experience to traditional dairy products [3,4].

**Food preservation:** lactose has antimicrobial properties that contribute to food preservation. It inhibits the growth of certain microorganisms, extending the shelf life of products. Lactose is used in the preservation of dairy products, meat, and seafood, helping maintain their quality and safety. Lactose plays a vital role in food technology, contributing to various applications ranging from dairy products to bakery, confectionery, pharmaceuticals, and more. Its unique properties, including solubility, mild sweetness, and low hygroscopicity, make it a versatile ingredient in the development of innovative food products. As the food industry continues to evolve, lactose continues to offer opportunities for creative formulations and improved sensory experiences. With ongoing research and technological advancements, lactose will likely remain a valuable tool for food technologists in creating delicious, nutritious, and appealing food products [5].

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