

THE FUTURE OF DAIRY: FERMENTATION-BASED MILK PRODUCTION, FUNCTIONAL PROPERTIES, AND NOVEL APPLICATIONS

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ABSTRACT

Fermentation-based milks are produced through fermentation of dairy proteins such as whey and casein and represent a transformative advancement in sustainable food technology. The article reviews the innovative products into whey protein-based, casein-based, and hybrid milks, highlighting their distinct functional and nutritional properties. The critical need for fermentation-based milks is underscored by their potential to address environmental concerns, meet shifting consumer preferences, and replicate the sensory and functional attributes of traditional dairy without reliance on animal farming. This review emphasizes the technological precision required to recreate authentic milk proteins. While fermentation-based milks offer significant advantages, including nutritional completeness, lactose-free composition, and reduced greenhouse gas emissions, and challenges such as production costs, allergenicity, and consumer perception persist. Fermentation-based milk products blend traditional fermentation methods with modern biotechnology, paving the way for a new era in dairy. They present a promising, eco-friendly alternative that can improve taste, nutrition, and overall functionality.

KEYWORDS Precision fermentation, fermentation-based milk, whey protein, casein, sustainable dairy, functional foods, biotechnology, plant-based hybrid, dairy alternatives