Technological Progress as a Driver of Innovation in Infant Foods

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Innovation is critical to continually improve the quality and accessibility of infant foods worldwide. Apart from non-technical factors such as market and economic forces, food science and nutritional technologies are often considered primary drivers of innovation in the food industry. These innovations arise primarily from (1) scientific advancement in infant/child nutrition, (2) development of novel ingredient technologies, (3) advancements in food safety technology (processing, packaging, etc.), and (4) the science of consumer insight and behavior as it relates to infant feeding. While each area is critical to continuous innovation of infant foods, parallel advancements in nutritional and food sciences play a central role in infant food innovation. This is largely due to continuous research on both nutritional and functional properties of human milk and subsequent integration of this knowledge into formula through creation and application of novel food ingredients [1]. Knowledge of the composition and functionality of human milk, including both nutritive and nonnutritive components, has specifically driven innovation of infant formulae and stimulated interest in novel technologies designed to more closely align infant formula functionality with that of human milk.

The desire to innovate through development of a better mimetic of human milk composition and functionality requires technological advancement in both food and ingredient technology in parallel with evolving nutrition science (fig. 1). This is particularly true in cases where functional components of human milk may not be commercially available in a fashion matching the naturally occurring components. For example, improved understanding of human milk protein composition has led to adjustments in total protein content and the ratio of bovine whey and casein in infant formula to better mimic human milk composition and nutritional value [2]. Characterization of long-chain polyunsaturated fatty acids in human milk and their association with infant eye and brain development
Nutritional and physiological considerations
- Nutrient and bioactive composition
- Bioavailability
- Growth and development
- Tolerance
- Physiological functionality

Nutrition research
characterization
composition function

Human milk
(evolving ‘gold standard’)
bioactive components
non-nutritive components
nutritive components

Infant formula
(evolving mimetic)
bioactive components
non-nutritive components
nutritive components

Food science +
ingredient technology
product
composition function

Product and consumer considerations
- Ingredient sourcing and technology
- Formulation and processing technology
- Food quality and safety
- Packaging
- Product functionality
- Sensory science
- Consumer science
- Regulatory

Fig. 1. Technological advancement drives innovation in infant foods. Technological advancements in nutrition science provide critical information on composition and functionality of human milk. Advances in food science, ingredient technology and consumer insight allow for translation of nutrition science to infant formula and foods.
has led to development of algal and fungal derived lipids suitable for enrichment of these fatty acids in infant foods [3]. More recently, a functional role for the carotenoid lutein in eye health has been identified. These findings, combined with data on the carotenoid content of human milk, have supported enrichment of infant formula with plant-derived lutein [4, 5]. These and additional examples illustrating how characterization of nutritive and nonnutritive components of human milk and their function has driven innovative adaptation of infant formula are discussed below.

In addition to food and ingredient technology, innovative opportunities will likely evolve from our expanding knowledge of how infant nutrition and feeding practices impact chronic disease risk in adulthood. For example, improved cardiovascular disease markers including BMI, lipoprotein profiles and blood pressure in adulthood have been associated with infants fed human milk compared to formula [6, 7]. Considering the potential long-term impact on health outcomes throughout the life cycle, this area will likely be a critical future driver of innovation in infant foods as research elucidates underlying mechanisms that may be applied in infant formula/food design.

While food and nutrition sciences continue to evolve and converge on health-related end points, future innovations in infant foods will include a focus on identification of novel, bioactive ingredients, preparations and/or delivery systems through the continued study of human milk composition, functionality and feeding practices. Efforts to better mimic human milk will depend on our ability to understand and match differences in milk composition and functionality that occur as a function of lactation stage, region, and mother’s diet [8]. Technological advancements in food and ingredient technology, processing and packaging sciences should include a consideration of the complexity of physical, chemical and biochemical interactions between individual nutritive and nonnutritive components and how these interactions influence bioavailability and functionality of bioactive compounds from human milk and resulting infant formula/foods.

References