

# Protein Quality, Growth, and Malnutrition: Advances in Science and the Role of Dairy Ingredients in Food Aid: Introduction

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## Abstract

This article is the introduction to our formal proceedings of the symposium titled “Protein Quality, Growth and Malnutrition: Latest Scientific Findings and the Role of Dairy in Food Aid,” held during the Experimental Biology 2015 annual meeting in Boston, Massachusetts.

## Keywords

malnutrition, dairy, protein, food aid, growth

At the 2015 Experimental Biology annual meeting, a symposium was held, titled, “Protein Quality, Growth and Malnutrition: Latest Scientific Findings and the Role of Dairy in Food Aid.” The papers in this supplement of *Food and Nutrition Bulletin* were presented at this event. The purpose of the symposium was to evaluate the state of the science on the role of dairy ingredients in various food aid products for the treatment of malnutrition and stunting among babies and pregnant women. Attention was given to the role that dairy ingredients play in improving the protein quality and overall nutritional profile of food aid products. Researchers from Europe and the United States assembled to share their learning from experience in developing countries: formulating products, evaluating their effects on achieving recovery from malnutrition and enhancing growth, and developing new methods to measure the effectiveness of enhanced formulations on improving outcomes. A key consideration in the development of food aid products is

the nutritional content in relation to the cost of an ingredient and the amount of the ingredient needed to achieve the desired benefit. Studies using dairy ingredients (which provide high-quality protein but may be more expensive) are focused on this question. While other protein sources may be less expensive, their protein quality is inferior to that of dairy ingredients, necessitating the need for larger portions or supplementation by other protein sources.

While virtually hundreds of studies have been conducted over the last several decades on malnutrition, and ways to alleviate it via food aid products, much remains to be learned about the best way to optimize food aid products. Thus, the

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questions the speakers at this symposium sought to answer were (1) Given the high quality of protein in dairy ingredients, do research studies demonstrate that they are more effective than other options in the treatment of malnutrition and in achieving recovery from stunting when included in food aid products? (2) How does the availability of a new method to evaluate protein quality, the Digestible Indispensable Amino Acid Score, (DIAAS) can be used in the improvement of food aid products? and (3) Which other components beyond high quality protein does dairy provide that play a critical role in the treatment of malnutrition and/or growth promotion?

The first speaker, Dr Nina Schlossman, presents a history of the development of food aid. Those programs were established during the 1960s in response to episodes of famine, and over the ensuing 55 years, they have evolved, using various products to prevent and treat malnutrition in pregnant women, infants, and young children. Dairy ingredients were included at the start of food aid, were removed in the 1980s, and now are being reincorporated into new products. Partnerships between governmental and nongovernmental agencies have developed to continually improve nutrition via effective program development, implementation, and evaluation. A key consideration is the value dairy ingredients provide in terms of protein quality.

Dr Shibani Ghosh writes about her research on protein quality in the first 1000 days, the time period from conception to 2 years of age. She notes the importance of protein quality in pregnancy and the ability of high-quality protein to prevent infant stunting and promote growth. In cases of moderate acute malnutrition and severe acute malnutrition of children, high-quality protein products form the basis of treatment. Finally, she reviews the newest methodology to evaluate protein quality, DIAAS, and identified opportunities and challenges in assessing protein quality.

Dr David Clark expands on the consequences of malnutrition during pregnancy, that is, the delivery of infants of low birth weight. He points out the vicious cycle created by the birth of stunted infants who grow poorly, becoming stunted girls, and eventually stunted mothers, giving birth to another generation of low birth weight

infants. He provides optimism to this situation by pointing out that nutritional improvement, including the consumption of dairy ingredients during intrauterine life and childhood, can result in just 1 generation in increased heights of children who are up to 8 cm taller than their parents.

Dr Mark Manary adds a new dimension to the discussion of the importance of protein quality on growth. He describes how protein requirements are driven by physiological state, yet standards for the determination of protein quality have been predicated on the protein requirements of 3 healthy age-groups—infants, rapidly growing young children, and all others. Vulnerable populations, for example, malnourished children or those with infections, and pregnant women ought to have protein requirements that match their unique needs, and he presents evidence that growth is improved when these unique high protein quality needs are met.

Ms Jacklyn Weber and Ms Meghan Callaghan demonstrate their innovative, computer-modeling approach to optimizing ready-to-use therapeutic food formulations. Their model integrates numerous variables, such as ingredient availability, cost, ease of production, nutritional requirements, consumer preferences, and sensory acceptability to build ready-to-use therapeutic food formulations for specific populations that will satisfy nutritional needs while being culturally and economically sensitive.

Dr Cindy Schweitzer reviews the regulatory environment for food aid products. She explains that Codex Alimentarius is the organization providing internationally accepted standards for foods to assure product quality and safety and to facilitate trade. Food aid products also need the assurances derived from having standards established by Codex Alimentarius, but she advises that these standards should not be overly prescriptive. Since an array of food aid products meeting differing nutritional requirements can be envisioned, it is prudent not to take a “one-size-fits-all” approach in terms of product composition.

The final speaker, Dr Douglas DiRienzo, identifies research gaps in the use of dairy ingredients in food aid products. He notes that, in spite of decades of research producing thousands of

studies on food products for treating malnutrition, the field has been hampered by several obstacles. Early on, studies conducted were on interventions instead of controlled clinical trials, following CONSORT guidelines. Second, the research community needs consensus on, and consistent application of, research best practices and methodologies. Finally, more research is needed on dairy ingredients to determine at which level they have a unique impact on growth, and the optimal levels of dairy ingredients based on the effective cost of treatment.

In summary, the symposium confirmed that dairy ingredients provide high-quality protein that contributes to the effectiveness of the treatment of malnutrition and in recovery from stunting. Even when their higher unit cost is considered versus other protein sources, the cost may be offset by shorter treatment durations and better outcomes. Compared to other protein sources used in food aid products, the DIAAS

confirms that dairy proteins are superior. The adoption of DIAAS may help in balancing lower quality proteins with dairy proteins in formulations to enhance their efficacy. Evidence for the role of dairy ingredients in delivering growth long term, either via their protein content or other components, such as lactose, is evolving. The field of research on the treatment of malnutrition via the use of food aid products could be further enhanced by standardization of study methodologies and reporting.

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