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More protein post-exercise leads to greater anabolic response

Importance of protein quality in mid-to high-income countries

Is higher lactoferrin exposure beneficial for brain size in pre-term infants?

Bovine lactoferrin plus osteopontin promotes immune system development and maturation

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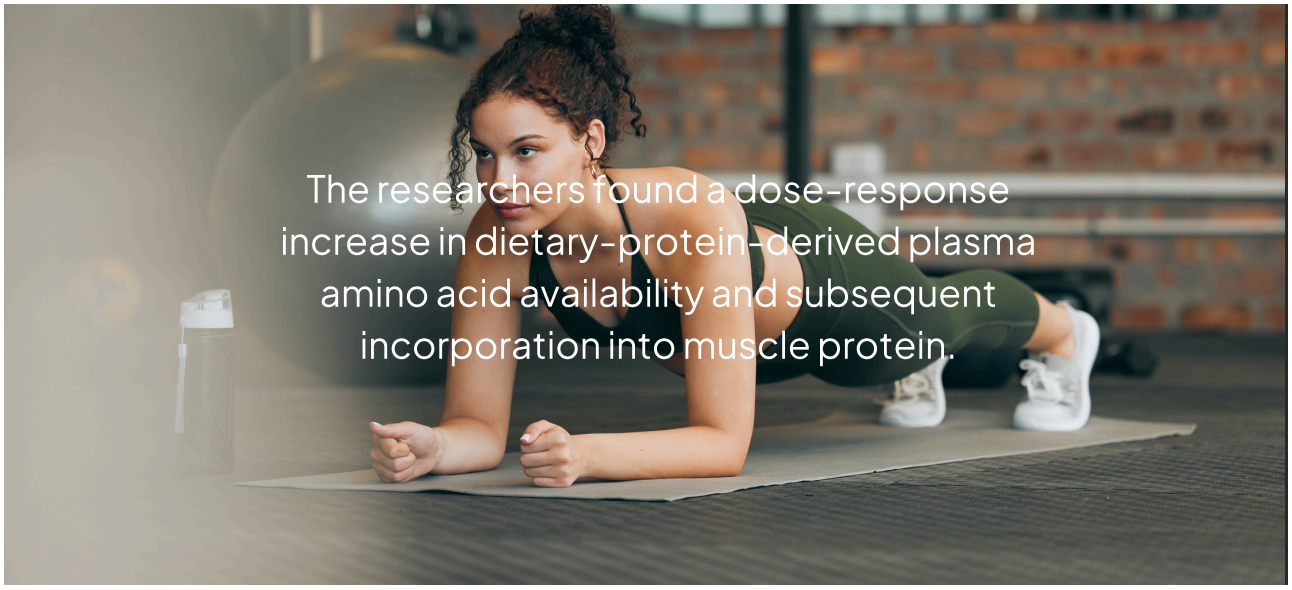
More Protein Post-Exercise Leads to Greater Anabolic Response

There is ongoing belief that there is an upper limit to the anabolic response to feeding after exercise and that excess amino acids are used as fuel instead of being incorporated into the muscle. However, this belief lacks scientific proof and has recently been challenged through a human clinical trial. Using a comprehensive undertook a 60-min resistance training session, undertook a 60-min resistance training program, then received 25 g protein (25PRO), 100 g protein (100PRO), or a placebo (0PRO). Stable isotope amino acid infusions were applied, and blood and muscle tissue samples were collected over time to assess protein digestion. The protein was milk protein concentrate from intrinsically labeled milk. The researchers found a dose-response increase in dietary-protein-derived plasma amino acid availability and subsequent incorporation into muscle protein. Ingestion of the large bolus of protein further increased whole-body protein balance, as well as protein synthesis rates of different tissues, including mixed-muscle, myofibrillar, muscle connective, and plasma protein. Protein ingestion also had a negligible impact on whole-body protein breakdown or use of amino acid as fuel (oxidation). These pivotal results "demonstrate that the magnitude and duration of the anabolic response to protein ingestion is not restricted and has previously been underestimated in vivo in humans." Trommelen et al. Cell Rep Med. 2023 Dec 19;4(12):101324.



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Importance of Protein Quality in Mid-to High-Income Countries

Protein intake in western countries is usually considered to be adequate, above the recommended dietary allowance (RDA), and thus, protein quality is often deemed to be of little importance. This was challenged in a new analysis of the NHANES population data on actual protein intakes in the USA. When taking protein quality into account through the gold standard scoring method, DIAAS (Digestible Indispensable Amino Acid Score), 11% of the adult (19-50 years) population had habitual protein intakes below the Estimated Average Requirement (EAR) and 22% below the recommended dietary allowance (RDA). The percentage of the population with utilizable protein intakes potentially falling below the EAR increased as the assumed DIAAS declined. When focusing on certain demographics, including the elderly and some vegetarians and vegans, analysis of the NHANES data and several other datasets indicated that total protein intakes can be limited, with lower dietary protein quality in this group potentially leading to overall inadequate utilizable protein intakes.

The challenge of optimizing protein intakes for many with more specific physiological needs (eg weight loss, endurance sports, resistance exercise) was also highlighted, particularly when attempting to meet higher dietary protein targets often with accompanying lowered energy intakes. Low dietary protein quality can lead to protein calories expressed as a proportion of total calories, falling outside what may be acceptable limits (maximum of 30% protein calories from total calories). In general, individuals within the adult population may be susceptible to macro-nutrient imbalance, whenever total protein intakes are high, daily energy intakes low and for diets with lower protein quality (DIAAS <100%).
Moughan et al. J Nutr. Published online January 20, 2024.

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Is Higher Lactoferrin Exposure Beneficial for Brain Size in Pre-Term Infants?

Lactoferrin is a naturally occurring whey protein fraction found in mammalian milk. It has immuno-modulatory properties and has also been shown to be neuroprotective. Samples were taking at 14 and 28 days of chronologic age from human milk for 36 infants born <32 weeks' gestation, and lactoferrin measured by electrochemiluminescence multiplex immunoassay. Using Brain MRI scans obtained at term equivalent, the total and regional brain volumes were estimated. Comparison was then made between infants exposed to low vs. high lactoferrin and adjusted for gestational age, birth weight z-score, sex, and postmenstrual age. Compared to infants exposed to low lactoferrin, infants exposed to high lactoferrin had 43.9 cc larger total brain volume, 48.3 cc larger cortical gray matter, and 3.8 cc larger deep gray matter volume at term equivalent age. Other regional brain volumes were not statistically different between groups. This study highlighted that "higher lactoferrin exposure during the neonatal hospitalization was associated with larger total brain and gray matter volumes, suggesting that lactoferrin may have potential as a dietary supplement to enhance brain growth in the neonatal intensive care unit setting." The paper also noted that "lactoferrin… may be beneficial for preterm infant brain development, and therefore has potential as a dietary supplement in the neonatal intensive care unit setting."
Atayde et al. Pediatr Res. 2024 Jan 8.

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Bovine Lactoferrin Plus Osteopontin Promotes Immune System Development and Maturation

The infants immune system is immature, thus supplementation of infant formula can be of vital importance to boost the development of the immune system for formula fed infants. Lactoferrin (LF) and osteopontin (OPN) are essential proteins in human milk with immunoregulation properties. Scientific support is building for the synergistic effect that proteins in milk have with each other. Previous work has shown that a ratio of LF : OPN at 1 : 5 (denoted as LOP) had a synergistic effect on intestinal barrier protection, though it's unknown whether LOP can also exert a stronger effect on immunoregulation. Until now. Utilizing both in vitro and in vivo models of inflammation and early life development, it was shown that LOP increased the secretion of several immune factors, more than LF or OPN alone during development, and inhibited changes in immune cells and cytokines during the immune challenge. Furthermore, additional analysis of the components of digested proteins in vitro revealed that some of the expressed peptides may provide immunoregulation. Lastly, LOP increased the abundance of beneficial gut bacteria in the large instestine. The results demonstrate that lactoferrin-osteopontin is a potential immunomodifier for infants and offers a new theoretical basis for infant formula innovation.

Li et al. Food Funct. Published online January 2, 2024.

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Unveiling the Protective Role of Milk Fat Globule Membrane Proteins on Lactic Acid Bacteria in Acid-Stressed Environments

Lactic acid bacteria need to survive the acid-stressed environment of production and applications in order to be effective as probiotics. Utilising a way to protect probiotics in this environment may help ensure they maintain their bioactivity. The protective mechanism of milk fat globule membrane (MFGM) proteins on lactic acid bacteria under acid stress is one such method recently investigated. Scanning electron microscopy and fluorescence probe were used to analyze the condition of the acid-treated bacteria, which showed that MFGM proteins could enhance the survival ability of Lactobacillus acidophilus CICC 6074 under acid stress by maintaining cell structure, elevating pH and impacting enzyme activity. Furthermore, additional protein analysis revealed that MFGM protein could exert protective effects on L. acidophilus CICC 6074 through multiple pathways, including regulating amino acid metabolism, ATPase activity, gene repair and heritage.“The results will provide a new approach for the protection and development of functional lactic acid bacteria.”

Zhang et al. Food Chem. 2024 Feb 15;434:137297.

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