

Immune Protein Supplementation in Athletes: Attenuating Exercise-Induced Renal Stress, Intestinal Barrier Damage, and Inflammation

Sihui Ma¹, Katsuhiko Suzuki¹

1: Faculty of Sport Sciences, Waseda University

Prolonged strenuous exercise can challenge fluid balance, renal function, intestinal barrier integrity, and immune homeostasis in athletes. Dehydration may compound renal stress, while splanchnic hypoperfusion and thermal strain can disrupt the intestinal barrier and promote inflammation. These interconnected responses are important targets for nutritional support. Immune protein (IMP), a concentrated product of hyperimmunized cow milk, is a candidate nutritional strategy with barrier-protective and anti-inflammatory potential.

In a double-blind, randomized, placebo-controlled crossover study, seven healthy male long-distance runners consumed IMP (10 g twice daily) or a matched placebo for 8 weeks, separated by a 1-month washout. Participants completed 3000-m time trials before supplementation and after 4 and 8 weeks. Urine obtained before and after each trial was analyzed for renal and dehydration-related indices, including N-acetyl- β -D-glucosaminidase (NAG), osmotic pressure, and specific gravity; intestinal fatty acid-binding protein (I-FABP), a marker of intestinal epithelial injury and permeability; and inflammatory mediators, including interferon-gamma (IFN- γ), interleukin-1 beta (IL-1 β), and tumor necrosis factor-alpha (TNF- α).

The 3000-m time trial increased urinary NAG, consistent with acute renal tubular stress, but IMP did not modify NAG. In contrast, after 8 weeks of IMP supplementation, the exercise-associated changes in urinary osmotic pressure and specific gravity were attenuated, suggesting preservation of renal concentrating function under dehydration-related stress. IMP also significantly attenuated the exercise-induced rise in creatinine-corrected urinary I-FABP, supporting protection of intestinal barrier integrity. Exercise-related increases in urinary IFN- γ and TNF- α were inhibited, while IL-1 β showed an inhibitory trend. Race performance, perceived exertion, and body composition did not differ between conditions, and no adverse events were self-reported or observed.

These findings support an integrated model in which IMP may help athletes maintain renal concentrating function, limit exercise-induced intestinal epithelial injury, and dampen inflammatory responses. Improved barrier integrity may reduce lipopolysaccharide translocation and thereby contribute to the lower cytokine response, although this mechanism was not directly tested. In this lunch seminar, I will discuss the physiological links among dehydration, renal dysfunction, intestinal permeability, and inflammation; the translational relevance of IMP supplementation; and the need for confirmation in larger cohorts and under more strenuous or heat-stress conditions.

Immune Proteins in Sports: Effects on Salivary Mucosal Immunity in Athletes

Gen Tanabe¹, Katsuhiko Suzuki²

1: Department of Sports Dentistry, Meikai University

2: Faculty of Sport Sciences, Waseda University

Immune proteins (IMP), also known as hyperimmune milk, are protein-rich milk powder produced by vaccinating dairy cows with multiple antigens to produce pathogen-specific antibodies. The milk obtained from these hyperimmunized cows was concentrated, resulting in a supplement enriched with immunoglobulins directed against specific pathogens, including *Escherichia coli*, *Salmonella*, *Shigella*, and *Staphylococcus aureus*.

Previous studies have shown that IMP causes a direct antigen-antibody response to pathogens and inhibits increased intestinal permeability. These mechanisms suggest that IMP supplementation exerts protective effects via a dual-layer passive immune system comprising IgG-mediated pathogen neutralization and IgA-mediated mucosal barrier stabilization.

In competitive sports, maintaining optimal physical condition and immune function is essential for athletes seeking to sustain high training loads and maximize their performance. However, athletes who engage in repeated high-intensity training are exposed to physiological stressors that can provoke systemic inflammation, organ damage, transient immunosuppression, and an increased incidence of upper respiratory tract infections (URTIs). Among the mechanisms underlying disruptions in inflammatory signaling, exercise-induced disruption of intestinal barrier function (“leaky gut”) has attracted attention as a potential initiating factor.

Accordingly, there is growing demand for effective strategies to mitigate training-induced immune dysfunction in athletes. Among the various approaches proposed, nutritional interventions have attracted attention because of their feasibility and applicability in daily training environments. In this context, our research has focused on the potential role of immune proteins in sports. In this seminar, we will present our findings on the eight weeks effects of IMP supplementation on salivary mucosal immunity in athletes, focusing particularly on secretory IgA and changes in the microbiota.

Ma S, Tominaga T, Kanda K, Sugama K, Omae C, Hashimoto S, Aoyama K, Yoshikai Y, Suzuki K. Effects of an 8-Week Protein Supplementation Regimen with Hyperimmunized Cow Milk on Exercise-Induced Organ Damage and Inflammation in Male Runners: A Randomized, Placebo Controlled, Cross-Over Study. *Biomedicines*. 2020; 8(3):51. <https://doi.org/10.3390/biomedicines8030051>