Probiotics & Performance: The Hidden Language of Exosomal Hsp60 in Exercise

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Introduction:

Heat shock proteins (Hsp), particularly Hsp60, play a crucial role in regulating the cellular stress response and have also been identified in plasma-derived exosomes (Barone et al., 2016), suggesting a potential function in intercellular signalling. Exercise, both aerobic and anaerobic, can modulate the release of Hsp60 through exosomes, thus influencing cellular communication. In our previous publication, we already described how L. fermentum influenced the NF-κB signaling pathway, inducing the expression of Hsp60 (Paladino et al., 2023). This study aims to analyze Hsp60 levels in exosomes isolated from the plasma as well as anti and pro-inflammatory cytokines levels (e.g. IL-6, TNF-α, IL-10) of three groups of subjects: sedentary, runners, and CrossFit athletes, before and after a period of supplementation with probiotics.

Methods:

Fifteen males were enrolled in our study: a sedentary control group, a runner group, and a CrossFit group. All participants underwent basal blood sampling (T0) before and after an exercise session to assess the acute response to physical activity. Subsequently, each group received supplementation of probiotic blend for two months. At the end of the supplementation period, subjects were assessed again by blood sampling before and after an acute exercise session.

Plasma-derived exosomes were isolated using standardized ultracentrifugation protocols. The presence of exosomes was confirmed by detecting specific markers by western blotting. In addition, the expression of Hsp60 within the exosomes was analyzed. In parallel, the levels of inflammatory and anti-inflammatory cytokines were quantified using MagPix® (ThermoFisher Scientific).

Discussion & Conclusion:

Preliminary results indicate variations overall in Hsp60 levels between groups, with differences between the activities, suggesting that the type of exercise influences the release of this protein through exosomes. Furthermore, it is hypothesized that exosome-mediated cellular communication may originate from muscle cells, contributing to the transport of molecular signals to other tissues. These results suggest that exercise may modulate the release of Hsp60 in plasma exosomes, and probiotic supplementation may play a role in regulating this response. Further studies are needed to clarify the mechanisms underlying this modulation and its impact on intercellular communication, the inflammatory response, and the change in performance.

Reference:

Paladino, L. et al (2023). NF-kB Regulation and the Chaperone System Mediate Restorative Effects of the Probiotic Lactobacillus fermentum LF31 in the Small Intestine and Cerebellum of Mice with Ethanol-Induced Damage. Biology, 12(11), 1394.

Barone, R. et al. (2016) Skeletal muscle Heat shock protein 60 increases after endurance training and induces peroxisome proliferator-activated receptor gamma coactivator 1 α1 expression. Sci Rep 6, 19781.