

## **The effect of glutamine in modulating exertional heat stress response of intestinal cells in trained and untrained runners**

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### ABSTRACT

Glutamine is the preferred substrate of intestinal cells and is required for the protection of intestinal cells integrity, helping to prevent exercise-induced endotoxin leakage from the intestine during stressful conditions. Increased endotoxins in the blood circulation (also known as endotoxaemia) has been shown to trigger systemic inflammation which is implicated in exertional heat stroke. This study examined firstly whether orally administered glutamine helps to reduce intestinal injury following an acute high intensity exercise session in hot conditions and secondly whether there is a different outcome according to fitness levels in runners. A randomized, double-blinded crossover study design was utilized. Twelve runners unacclimatised to heat, divided into trained [T; n=6; maximal oxygen uptake ( $VO_{2max}$ ) =  $61.2 \pm 1.0 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ ] and untrained (UT; n=6;  $VO_{2max}$  =  $51.0 \pm 0.7 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ ) groups, ingested either a placebo or glutamine dipeptide supplement (L-alanyl-L-glutamine; 0.2 g/kg bodyweight/day) for 5 consecutive days before running at 70% $VO_{2max}$  in a climate chamber (30°C, 40% relative humidity) for 1 hour. Cardiac output, stroke volume, heart rates, sweat loss, percent dehydration, rectal and skin surface temperatures were measured. Venous blood samples at baseline, immediately after completion of run and 1-hour post run were analysed for endotoxins and intestinal fatty acid binding proteins (I-FABP) as markers of intestinal injury. Intestinal permeability was measured at pre and post exercise using dual sugar probes (L-R; lactulose and rhamnose). No significant difference was observed in all responses for training status. L-R ratios remained unchanged with or without glutamine. However, a significant main effect for time and treatment was observed for plasma I-FABP ( $p < 0.05$ ). No correlation was observed between plasma I-FABP and endotoxins. These data indicate that increased I-FABP is a sensitive marker for the early detection of intestinal injury in acute high intensity running compared to urinary L-R ratios.