JSM

JOURNAL of SPORTS SCIENCE & MEDICINE

Journal homepage ISSN: 1303 - 2968

Research article

Effects of Prolonged Endurance Exercise on Vascular Endothelial and Inflammation Markers

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Author Information Publish Date How to Cite

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ABSTRACT

Systemic inflammation has been found in association with vascular endothelial function for clinical implications including exercise-induced pathology. However, information on the relationship between the exercise-related inflammatory responses and endothelial function is limited. This study aimed to investigate the effects of prolonged endurance exercise on the expression of selected soluble adhesion molecules and inflammatory markers. Twenty-four middle-aged males participating in a 308 km ultra-marathon were recruited in this study. Venous blood was collected at baseline, 100 km, 200 km, and 308 km for the analysis of sVCAM-1, sE-selectin, leukocytes, hs-CRP, CK, and TNF-α. Significant increases of sVCAM-1, sE-selectin, and leukocytes were observed at 100 km. sVCAM-1 had the greatest significant increase at 100 km. In addition, sVCAM-1 was significantly associated with the running speed and leukocytes. sE-selectin was significantly associated with leukocytes, hs-CRP, TNF-α, and CK. Delayed rises in hs-CRP and CK were observed at 200 km. TNF-α fluctuated throughout the race with a significant increase at 308 km. Delayed onset of hs-CRP and continuously increased sE-selectin suggest anti-inflammatory responses to suppress pro-inflammatory markers such as TNF-α. Prolonged repetition of muscle contraction may have released delayed CK and significant rise in TNF-α toward the end of the race. The present study demonstrated an activation of the surrogate markers of endothelial dysfunction in relationship to exercise intensity and

leukocyte trafficking without a significant activation of the inflammatory responses. Thus, alteration of the endothelium may be related to increased blood flow and shear stress put upon the endothelium in response to increased oxygen demand on the heart.

Key words: Endothelial function, inflammation, leukocytes, vascular adhesion molecules, ultra-marathon

Key Points

- Systemic inflammation is associated with vascular endothelial function for clinical implications including exercise-induced pathology.
- Inflammatory process involves a cascade of inflammatory and endothelial markers.
- A prolonged endurance ultra-marathon induced significant increases in systemic inflammation and vascular endothelial markers at different checkpoints.
- sVCAM-1, a surrogate marker of endothelial dysfunction, significantly increased in response to increased exercise intensity and leukocyte trafficking without significant changes in the inflammatory markers.
- Prolonged repetition of muscle contraction may have delayed released of pro-inflammatory markers, CK, hs-CRP, and TNF-α.