Mechanistic Insights into The Effects of Exercise on Inflammatory Responses.
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Introduction:

Despite the importance of the inflammatory response in fighting infections, prolonged or unwanted inflammation is the root cause for serious human diseases including atherosclerosis and cancer. Therefore, understanding how inflammation is regulated is crucial for preventing these diseases. The objectives of this study include conducting in-vivo and ex-vivo experiments to gain an in-depth understanding of the molecular pathways and the regulatory elements of the inflammatory response that are altered following various levels of exercise intensities and durations.

Methods:

C57/Bl6 mice were randomly assigned to two groups: a control group where no exercise was performed, and a second group where a single bout of moderate exercise intensity (i.e. 20 m/min for 60 min) was carried out for 5 days per week for a total of 9 weeks. Bone marrow-derived macrophages (BMDMs) were isolated from mice of both groups and were then stimulated with several inflammatory pathways inducers, such as Lipopolysaccharide (LPS) from Gram negative bacteria, the viral dsRNA mimic, poly I:C, and bacterial peptidoglycan component, muramyl-dipeptide (MDP). mRNA was then extracted, and gene expression of pro- and anti-inflammatory cytokines was measured by real-time PCR. Furthermore, activation of the pro-inflammatory transcription factors NF-κB and IRF3 was assessed by Western Blotting.

Results:

Our data demonstrate that moderate exercise enhances NF-κB activation leading to an increase in production of pro-inflammatory cytokines such as IL-6 and TNF-α. Similarly, we show that moderate exercise causes an increase in IRF-3 activation, which leads to an induction of IFN-β.

Discussion:

Our data indicate that moderate prolonged exercise causes an enhancement of inflammatory signaling and associated cytokine production, which might lead to improved immune responses to certain infections. Future experiments will focus on additional mechanistic insights or details on how exercise is exerting these effects. We will also test how other exercise intensities and durations alter the course of inflammatory diseases in vivo.