

## **Physical exercise and its implications for aging immunity and adoptive transfer immunotherapy**

SIMPSON RJ

Laboratory of Integrated Physiology, Department of Health and Human Performance, University of Houston, Houston, TX, USA.

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### ABSTRACT

Advancing age is associated with a profound decline in the normal functioning of the immune system that is commonly referred to as immunosenescence. Impaired responses to vaccination and the increased incidence of infection and malignancy seen in the elderly are often considered to be a direct consequence of immunosenescence. A large body of cross-sectional data has shown that habitual exercise is associated with enhanced functional responses in both the innate and adaptive arms of the aging immune system, indicating that exercise may help curtail the onset of immunosenescence. However, it is not known if exercise is also capable of reversing the detrimental effects of aging on an already weakened immune system. The first part of this presentation will focus on the known effects of habitual exercise at preserving the aging immune system and discuss avenues for future research to test the hypothesis that exercise has immune rejuvenating properties in the elderly.

Cancer is widely considered to be an age-related disease, with hematopoietic stem cell transplantation (HSCT) being the preferred treatment for many patients with hematologic malignancies. However, HSCT is associated with significant morbidity and mortality especially due to viral infections (i.e. cytomegalovirus, Epstein-Barr virus and adenovirus) and relapse. The second part of this presentation will focus on the immuno-enhancing effects of acute exercise as a means of increasing the efficacy of adoptive transfer immunotherapy - the passive infusion of ex vivo expanded donor-derived or autologous immune cells to a cancer patient recipient. Our early work in this area indicates that a single bout of exercise can augment the ex-vivo expansion of donor-derived NK-cells and antigen-specific T-cells for use in allogeneic adoptive transfer immunotherapy. This may offer a safe and cost-effective method to improve prognosis and reduce mortality in cancer patients after HSCT.