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High-Intensity Exercise Serum Alters Glycolytic Metabolism and Proliferation Rate of A549 Lung Cancer Cells

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Introduction:

Numerous studies have reported exercise-induced changes in circulating factors that may partly explain the association between physical activity and reduced cancer risk (1, 2). Acute exercise-conditioned serum from both healthy individuals and patients has been shown to reduce the viability of several cancer cell lines, suggesting that transient changes in soluble factors such as cytokines/myokines may target key cancer hallmarks. However, the mechanistic pathways responsible for these effects remain poorly understood. This study aimed to investigate the effects of lifelong and high-intensity exercise-conditioned serum on cancer cells bioenergetics and proliferation.

Methods:

Cardiorespiratory fitness (VO_{2max}), body composition, and serological profiles were assessed in 13 master athletes and in 13 healthy age-matched non-exercisers. Using in vitro assays, human lung carcinoma cell cultures (A549) were exposed to serum collected at rest and following a progressive maximal aerobic test, from both cohorts. Cellular bioenergetic phenotype and proliferation rate were evaluated across three independent experiments.

Results:

Master athletes had a higher relative VO_{2max} , increased muscle mass, and reduced fat mass compared to non-exercisers. While serum L-lactate concentrations at rest and post-exercise were similar between cohorts, cytokine and growth factor profiles differed in a cohort-dependent manner. Acute exercise-conditioned serum from both master athletes and non-exercisers significantly reduced L-lactate production by A549 cells, which was associated with reduced proliferation rate. Moreover, L-lactate concentration in culture medium supplemented with participant's serum showed a statistically significant moderate negative correlation with A549 cells proliferation rate.

Conclusion:

These findings suggest that reductions in cancer cell proliferation may be mediated by exercise-induced modulation of the serological profile. Acute exercise-conditioned serum from both athletes and non-exercisers reduced cancer cell proliferation, supporting the concept that each exercise bout may cumulatively contribute to cancer prevention. Furthermore, the effects of exercise on cancer cells appear to be linked to exercise intensity and bioenergetic pathways.

Keywords

Cancer cell; Cytokine; Exercise; Metabolism.

Conflict of Interest & Ethical Approval

yes

Abstract submitters declaration

yes

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