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EFFECTS OF THERAPEUTIC EXERCISE TRAINING ON SYSTEMIC INFLAMMATION IN SMOKE EXPOSED MICE

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INTRODUCTION

Long-term cigarette smoking has an important extrapulmonary toxicity. Recent studies suggested that inflammatory processes in the pulmonary systems spill over to systemic inflammation which negatively affects several extrapulmonary organs and tissues. Regular exercise training has been shown to be an effective non-pharmacological treatment strategy which has anti-inflammatory properties. The aim of the study was to investigate the effects of regular exercise training systemic inflammation in long term smoke exposed mice.

METHODS

C57bl/6j-mice (n=30) were randomly separated into three groups to receive either:⁽¹⁾ 8 months exposed to mainstream cigarette smoke for 6 h/day, 5 days/wk (smoke-exposed (SE) group),⁽²⁾ 8 months cigarette smoke and 2 months of exercise training for 30 min/day, 5 days/wk (SEex group) and⁽³⁾ age matched controls with no specific treatment (Con group). Inflammatory markers and adhesion molecules on lymphocytes were analyzed by flow cytometry (Beckman Coulter, EPCIS XL). Levels of various inflammatory plasma cytokines were quantified by a multiplexed fluorescent bead-based immunoassay (Luminex; Myriad RBM, Austin, TX).

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RESULTS

Mice of the SE group showed a significant decline of VO_{2max} and V_{max} , which was reversed by exercise training ($p < 0.05$). The increased expression of VCAM-1, ICAM-1 and CD62L on CD3⁺, CD3⁺CD4⁺ and CD3⁺CD8⁺ cells after smoke exposure was significantly down-regulated in the SEex group ($p < 0.05$). Similarly, several plasma cytokines such as interleukin-1alpha (Il-1alpha), monocyte chemotactic protein-3 (MCP-3), macrophage inflammatory protein-1beta (MIP1beta), MIP-1alpha, Factor VII, Tissue inhibitors of metalloproteinases-1 (TIMP-1), and CD40L, which were increased in SE mice, were down-regulated by therapeutic exercise training.

CONCLUSION

Exercise training reversed cigarette smoke-induced systemic inflammation and inflammatory priming of lymphocytes. It is assumed that the systemic anti-inflammatory effects of exercise are beneficial to several extrapulmonary impairments after smoke exposure.

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