

E41012 Evaluation of Physical Exercise from Stress Protein

- Change of HSP70 Expression in Liver and Skeletal Muscles after Acute Treadmill Running in Rats -

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Purpose: Although endurance exercise training improves various physiological function, the molecular mechanism for the acquisition of adaptability has not been elucidated. Stress protein is one of the key factors for explaining stress tolerance. The purpose of this study is to investigate the change of HSP72 and HSC73 expression in rat tissues after an acute endurance exercise relating to exercise intensity.

Methods: Male Wistar rats (7-weeks old) were used in this study. Rats ran at two different speeds of lower (13m/min) and higher (24m/min) intensities for one hour on the treadmill. Livers and skeletal muscles were removed at 0,3,6,9,12 and 24 hours after running. The expression of HSP72 and HSC73 were investigated by western blotting using HSP72 and/or HSC73 specific antibodies.

Results: Both expression of HSP72 and HSC73 in liver significantly increased 3-9 hours after the higher intensity exercise. In plantaris muscle, HSP72 content did not significantly change, but HSC73 content significantly increased at 3-9hours after the exercise. Lower intensity exercise did not increase HSP72 in liver.

Conclusion: From the present study the exercise intensity could be important for the induction of HSP70s. A factor of this intensity relating HSP70 increase is to be elucidated in near future.

Keywords: Exercise, HSP70, Liver

E41013 Effects of Aging and Exercise on Macrophage and Lymphocyte Functions in the Elderly Mice.

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Objective: This study was designed to evaluate the effects of aging and an 8-week voluntary exercise on macrophage and lymphocyte functions in mice.

Methods: Male BALB/c inbred mice were divided into three groups: a group given voluntary exercise (1 year old, n=20: Old-EXR), a control group (1 year old, n=20: Old-CTL) and a young control group (9 weeks of age, n=20: Y-CTL). Exercise consisted of spontaneous running in wheel (3 days a week). Regarding indices of macrophage and lymphocyte functions, we measured glucose consumption, lysosomal enzyme (APH, GLU), NO₂⁻ and IL-1β by peritoneal macrophages and then mitogenic response, IL-2, IFN-γ and IL-4 productions of spleen cells *in vitro*.

Results: Concerning the effect of the aging, the Old-CTL group showed a significant decrease in glucose consumption, APH and GLU, NO₂⁻ and IL-1β productions in the peritoneal macrophages, compared to the Y-CTL group. In the splenic lymphocyte functions, mitogenic response and IL-2 production in the Old-CTL group were significantly lower than those in the Y-CTL group, and IL-4 production was significantly increased. IFN-γ production was not different in the Y-CTL and the Old-CTL groups. Assessment of the effect of the voluntary exercise showed that glucose consumption, GLU, NO₂⁻ and IL-1β productions of the peritoneal macrophages in the Old-EXR group were significantly higher than those in the Old-CTL group. In the splenic lymphocyte functions, mitogenic response and IL-2 production in the Old-EXR group were significantly increased, and IL-4 production in the Old-EXR group was significantly decreased. No differences in IFN-γ production were found between the Old-CTL and the Old-EXR groups.

Conclusion: These findings suggest that voluntary running exercise suppressed the lowering of macrophage and lymphocyte functions in association with the aging factor, and that it contributes to the prevention of the immunosenescence.

Keywords: macrophage function, cytokine, immunosenescence