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E/III-14 CARDIAC EFFECTS OF ACUTE EXHAUSTIVE EXERCISE IN A RAT MODEL

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Background: The role of physical exercise in the prevention and treatment of cardiovascular diseases has been well-described, even though elevations in cardioneurotic biomarkers after prolonged exercise (i.e. ultramarathon running) were observed. We aimed to establish and validate a rat model of acute exhaustive exercise and determine the biochemical, molecular biological, structural and functional alterations in the heart.

Methods: Rats of the exercise group were forced to swim for 3h with 5% body weight (workload) attached to the tail, control rats were taken into the water for 5min. 2 hours after completion of swimming we performed left ventricular (LV) pressure-volume analysis using a pressure-conductance microcatheter to investigate LV function and mechanoenergetics. Additionally, blood and myocardium samples were harvested for biochemical and histological examination. Alterations of gene expressions were detected using qRT-PCR.

Results: When compared to controls, elevated plasma levels of cardiac troponin T (0.131 ± 0.022 vs. 0.025 ± 0.006 ng/ml), creatine kinase, transaminases and lactate dehydrogenase were detected after exhaustive exercise. Histological analysis showed sporadic fragmentation of myocardial structure and leukocyte infiltration. The relative myocardial expression of the anti-apoptotic bcl-2 was decreased (0.73 ± 0.06 vs. 0.97 ± 0.04), while the oxidative stress marker thioredoxin, as well as matrix metalloproteinase-2 (1.41 ± 0.14 vs. 1.04 ± 0.07), a marker of remodeling induced by oxidative stress injury showed increased expression. We observed increased end-systolic volume, decreased ejection fraction (48 ± 5 vs. $59 \pm 3\%$), impaired contractility (E_{es} : 0.60 ± 0.07 vs. 0.90 ± 0.05 mmHg/ μ l) and mechanical efficiency (47 ± 1 vs. $58 \pm 2\%$) of LV in the exercise group.

Conclusions: Excessive physical activity has an adverse effect on the heart. Enhanced oxidative stress and apoptotic signalling could underly the elevation of myocardial necrotic markers. The characteristic molecular and histological alterations are associated with functional impairment.

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Doctoral School: Basic Medicine

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András Kovács

Department

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Program: Patl

Supervisor: M

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