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**Wpływ jednorazowego wysiłku fizycznego
i długotrwałego treningu aerobowego na wybrane białka:
angiotensynogen, katepsynę B, transformujący czynnik wzrostu $\beta 1$
i czynnik martwicy nowotworu α
w wątrobie zdrowych szczurów**

The influence of one session of exercise and endurance training on selected proteins: angiotensinogen, cathepsin B, transforming growth factor $\beta 1$ and tumor necrosis factor α in the liver of healthy rats

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4 Streszczenie w języku angielskim

Topic:

The influence of one session of exercise and endurance training on selected proteins: angiotensinogen, cathepsin B, transforming growth factor β 1 and tumor necrosis factor α in the liver of healthy rats

Introduction:

Physical exercise causes adaptive changes, mainly in muscles, but it also influences other organs, including liver. Most changes are beneficial; however, strenuous exercise is a strong stressor, and it can result in splanchnic hypoperfusion with subsequent disturbances in liver homeostasis and energy. Intense exercise induces the production and release of cytokines, which play an important role in driving adaptive changes to exercise. However, overly strenuous exercise can cause cell damage, resulting in the activation of inflammatory reactions induced by the pro-inflammatory cytokine tumour necrosis factor (TNF- α) and fibrotic reactions involving transforming growth factor (TGF- β 1). Cathepsin B (CTS B) is a protease associated with protein turnover and extracellular matrix degradation. It is also involved in autophagy and activation of pro-inflammatory and profibrotic pathways. Angiotensinogen (Agt) is a glycoprotein synthesised mainly in hepatocytes and is the substrate for a cascade of enzymatic changes leading to the production of substances involved in the regulation of arterial pressure and the maintenance of water-electrolyte homeostasis in the body.

Aim:

The aim of this study was to evaluate the effects of 6-week training and one session exercise in untrained and trained rats on gene expression and production of selected proteins: Agt, Cts B, TGF β 1 and TNF α in the liver of healthy rats. In the case of CTSB, its activity was also assessed in the research models presented.

Material and methods:

We studied the effects of acute exercise and aerobic training on mRNA expression and protein levels of Agt, Cts B, TGF β 1 and TNF α in the liver of trained and untrained rats (n=30 each). For CTS B, the activity of this enzyme was additionally measured. Trained rats underwent 6 weeks of aerobic training with increasing loads. From each group, liver samples were collected before, immediately after, and 3 h after one session of intense exercise. Gene expression was evaluated with quantitative real-time polymerase chain reaction. Protein content was measured by enzyme immunoassay. CTS B activity was measured by spectrofluorometry.

Results and discussion:

One session of intense exercise did not influence gene expression Agt, Cts B, TGF β 1 and TNF α at any time point. In trained rats TNF- α and TGF- β 1 was increased immediately after exercise. The increase in TGF- β 1 persisted 3 h post exercise. In untrained rats the concentration of TNF- α did not change in any time point, while TGF- β was decreased both immediately and 3 h after intense exercise. Agt and CTS B concentrations did not change in both acute exercise groups at any time point tested. In trained rats, cathepsin B activity increased immediately after one exercise session. Six weeks of aerobic training did not result in any statistically significant changes in the expression and concentration of Agt, Cts B, TGF β 1 and TNF α , and in the case of the enzyme CTS B, also in its activity.

Conclusions:

Physical training does not alter gene expression or concentrations of the proteins tested in the liver of healthy rats and does not affect CTSB activity. Also, one session of exercise does not alter gene expression for the proteins tested. One session of exercise in untrained rats does not alter angiotensinogen, cathepsin B and TNF alpha concentrations, but causes a reduction in TGF beta 1 immediately after exercise, which also persists 3 h after exercise. One session of exercise in trained rats does not result in a change in angiotensinogen and cathepsin B concentrations, while TGF beta 1 and TNF alpha concentrations increase immediately after exercise, with a persistence for TGF beta 1 also 3 hours after exercise. One session of exercise causes an increase in cathepsin B activity immediately afterwards only in the liver in trained rats.