PROTEOMIC ANALYSIS OF EXERCISE-INDUCED HYPERTROPHY REVEALS SEX-RELATED MITOCHONDRIAL DIFFERENCES MEDIATED BY AMPK

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Regular physical activity results in characteristic structural and functional changes in the heart. The extent of exercise-induced left ventricular (LV) hypertrophy and functional changes show significant differences between men and women, the molecular background of which is not fully elucidated. The aim of this study was to provide a proteomic characterization of long-term exercise-induced LV myocardial hypertrophy in a rat model, focusing on sex-related differences.
Our male and female rats were divided into trained and control groups. In the trained groups, athlete's heart was induced by a 12-week swimming protocol. Myocardial hypertrophy was confirmed by echocardiography and functional adaptation by pressure-volume analysis. Proteomic measurements based on liquid chromatograph-coupled mass spectrometry were performed on proteins isolated from our LV myocardial samples.
Echocardiography showed significant LV hypertrophy in both sexes, which was more pronounced in female animals. LV contractility increased to the same extent in both sexes. Relative expression of 3074 proteins were determined by proteomics. There was a significant change in expression of 229 proteins in males and 599 in females compared to the level of same-sex controls. Based on our gene ontological analysis, physiological LV remodeling in females is characterized by increased expression of proteins in mitochondrial function and remodelling associated with increased expression of AMPK-SIRT3, whereas in males, proteins that bind to the actin cytoskeleton is primarily increased.
Our data suggests that physiological LV hypertrophy resulting from regular, balanced exercise is associated with sex-specific changes in the myocardial proteome and the AMPK-mediated mitochondrial distinctions might be in the background.

Keywords: athlete's heart, proteomic analysis, sex differences

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