

## Gender differences in cardiovascular exercise adaptation in a rat model

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**Context:** Physical activity increases the microcirculation of muscles. As a result of regular sport, segmental remodeling can be observed in the wall of the arteries.

**Objective:** Our hypothesis is that “athlete’s heart” is associated with the remodeling of the arteries manifested as “athlete’s artery”. Our aim was to study the morphological remodeling, reactivity and gender differences of exercise adaptation in muscular arteries in a rat model.

**Methods:** We studied the biomechanical features of gracilis arteries on 12 male and 12 female Wistar rats after a 12-week swimming program. In the swimming group (6 male-6 female), swimming time was 200 minutes/session 5 days/week, the control group (6 male-6 female) swam 5 minutes/day 5 days/week. After preparation of the arteries, we studied their reactivity to pressure (??m 0-150 mmHg) in normal Krebs and noradrenalin medium. External and internal diameter and wall thickness were also measured. Differences were tested with 2-way ANOVA. Significance was set at  $p < 0.05$ .

**Results:** Male and female trained groups had lower body weight (male:  $417.5 \pm 27.6\text{g}$  vs.  $470.5 \pm 21\text{g}$  and female:  $283 \pm 13.3\text{g}$  vs.  $289.2 \pm 14.8\text{g}$ ,  $p < 0.001$ ) and higher heart weight (male:  $1.64 \pm 0.24\text{g}$  vs.  $1.59 \pm 0.09\text{g}$  and female:  $1.27 \pm 0.10\text{g}$  vs.  $1.09 \pm 0.05\text{g}$ ,  $p < 0.001$ ) compared to controls. In the male control group, the external diameter of gracilis artery was the smallest and significantly smaller compared to the female controls ( $177.3 \pm 21\text{?m}$  vs.  $245.5 \pm 10.7\text{?m}$ ,  $p < 0.0001$ ) and the swimming males ( $177.3 \pm 21\text{?m}$  vs.  $229.2 \pm 26.7\text{?m}$ ,  $p < 0.001$ ). Male controls have the greatest wall thickness which was significantly greater compared to the female controls ( $25.9 \pm 2.4\text{?m}$  vs.  $16.9 \pm 1.4\text{?m}$ ,  $p < 0.001$ ). There was no difference in wall thickness between the swimming groups. In line with our results of the artery morphology, the reactivity to pressure in the noradrenalin medium was the lowest in male controls compared to the others. Distensibility was significantly higher in swimming groups compared to controls.

**Conclusions:** As a result of regular exercise, structural and functional remodeling can be observed on gracilis artery, as “athlete’s artery”. Male trained rats showed more pronounced vascular adaptation to exercise with increased external diameter and decreased wall thickness versus trained females. Differences in proportion of muscle and elastic fibers, and hormonal and autonomic mechanisms may be responsible for these characteristic vascular adaptation changes.

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