

Effect of Maternal Exercise on Adverse Cardio-Pulmonary Responses in Offspring Exposed to Post-Natal Chronic Hypoxia

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ABSTRACT

Emerging evidence shows exercise by women throughout pregnancy (i.e., maternal exercise) endows the offspring with positive health benefits and resistance to many diseases later in life. **PURPOSE:** To determine if maternal exercise reduces unfavorable cardiopulmonary development and improves exercise capacity in offspring after chronic hypoxic exposure throughout early life. **METHODS:** Female adult C57BL/6J mice were randomly assigned to one of the following groups: high altitude, sedentary (HS), high altitude, active (HE), or the respective, low-altitude conditions (LS or LE). Pregnant females in the exercise groups performed voluntary wheel running during mating and the perinatal period (about 4 weeks). Three days after birth, the pups in the high-altitude groups were exposed to chronic hypobaric hypoxia (450mmHg). When pups were eight weeks old, body size (weight and tail length) was measured and exercise capacity was assessed via a Rotarod test. Terminal procedures were performed to measure right ventricular systolic pressure (RVSP), hematocrit, and heart remodeling (Fulton's Index: right ventricular weight ratio to bodyweight (RV/BW) and to the left ventricle plus septum (RV/LV+S)). **RESULTS:** All variables measured had a main effect for altitude ($p < 0.01$). Compared to low altitude groups, HS and HE groups had lower exercise capacity and body size along with higher RVSP, hematocrit, RV/BW, and RV/LV+S, while HE had higher hematocrit (main effect for activity ($p < 0.05$)). An interaction effect was also found ($p < 0.01$) that showed higher RV/BW, driven largely by lower body weight, and lower tail-lengths for the HE group. The effect of hypoxia on offspring RVSP appeared to be meaningfully (but not statistically) attenuated by maternal exercise, warranting further investigation. **CONCLUSION:** Chronic hypoxia decreases exercise capacity and attenuates growth. This stress also induces potentially harmful cardiovascular changes, such as high blood viscosity, RVSP, and right ventricular hypertrophy. Our results indicate that maternal exercise may attenuate some of the negative effects of chronic hypoxia in the offspring, but does not prevent significant development impairments.