

## Effects of Maternal Diet and Voluntary Running on Mitochondria in Skeletal Muscle of Female Offspring

Kohei Takeda, Ph.D<sup>1</sup>, Yuki Nagano, B.S<sup>1</sup>, Tohru Takemasa Ph.D, M. D<sup>1,\*</sup>

<sup>1</sup>Graduate School of Comprehensive Human Science, University of Tsukuba, Tsukuba, Japan

\*Corresponding author: takemasa.tohru.gm@u.tsukuba.ac.jp

### Abstract

**Introduction:** It has been shown that maternal diet affects offspring health and skeletal muscle mitochondria. We investigated the synergetic effects of maternal high fat diet intake and voluntary wheel running on skeletal muscle mitochondria of female offspring.

**Methods:** C57BL/6J mouse (female, 4 weeks old) were divided into normal diet/sedentary (ND/Sed), normal diet/exercise (ND/Ex), high-fat diet/sedentary (HFD/Sed), and high-fat diet/exercise (HFD/Ex). Mice in exercise groups (ND/Ex and HFD/Ex) was housed individually in cages with a running wheel until mating (8 weeks). Mating with age-matched male mice began when female mice were 12 weeks old. Pre-pregnancy diet was maintained through gestation and lactation. After the mice were weaned, offspring were fed ND and did not perform any types of exercise until tissue sampling. Female offspring were sacrificed, and then skeletal muscle and white adipose tissue (WAT) were collected.

**Results:** Maternal diet and voluntary wheel running did not affect body and gastrocnemius muscle weight of female offspring. Inguinal WAT and gonadal WAT weight also were not changed by maternal diet and exercise. The ND/Ex and HFD/EX offspring groups exhibited elevated level of mitochondrial oxidative phosphorylation protein NDUB8. In addition, expression levels of mitochondrial fission proteins Fis1 and Drp1 were higher in the exercise groups than those in the sedentary groups.

**Conclusions:** Our results indicate that continuous maternal exercise until pregnancy partially activates both mitochondrial respiration complex and mitochondrial dynamics-related proteins in female offspring skeletal muscle. Further study is necessary to reveal detailed molecular mechanisms by epigenetic analysis.

**Keywords:** High fat diet, Voluntary wheel running, Mitochondria, Skeletal muscle