THE EFFECTS OF PHYSICAL ACTIVITY ON ADIPOSE TISSUE METABOLISM AND DNA METHYLATION

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ABSTRACT

The increased prevalence of obesity and diabetes threatens both the real and economic health of western counties. There were two major goals of this dissertation, 1) to determine if in response to inactivity and hyperphagia there is a decrease in fatty acid oxidation and mitochondria concentration in WAT, similar to skeletal muscle and liver and 2) to determine if physical active and sedentary mice have differentially methylated DNA in skeletal muscle. First, (chapter 2) I established that the increase in abdominal WAT during inactivity occurs even when food intake is restricted to the level of always-sedentary animals. A follow-up study (chapter 3) showed that the increase in WAT is not associated with a decrease in acid oxidation adipocytes fatty. Markers of WAT mitochondrial protein content (cytochrome c, COXIV-subunit I, and citrate synthase activity) significantly increased from 13 to 40 weeks in the wild type rats, were significantly attenuated in the hyperphagic sedentary rats, but were partially restored to the wild type levels with wheel running in the hyperphagic rats. Although strong evidence suggests that differences in DNA methylation in physically active and sedentary animals can occur, I was unable to verify candidate genes selected based on initial microarrays. However, two novel physical activity responsive genes were found, *Dnmt3a* and *Pitx3*. Future studies are needed to examine the feasibility of differences in DNA methylation occurring in response to physical activity. In summary, WAT oxidative phenotype is modified by aging and physical activity, while it remains unclear whether DNA methylation differences in skeletal muscle can occur.