

## **Effects of High Fat Diet and Exercise on the Metabolism of Maternal Hearts during Pregnancy**

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### ABSTRACT

Obesity has become a major concern for developed nations across the world, and the United States is the country which is most affected by this pandemic. Excess adiposity is known to cause chronic inflammation, diabetes, cancer, and cardiovascular disease: the leading cause of death for over a decade. With many women of reproductive age considered overweight or obese, the association between obesity and metabolic disorder is concerning. Positive metabolic health outcomes of offspring due to maternal exercise have been documented; however, little is known about how maternal exercise modifies high fat diet associated metabolic dysregulation upon mothers during gestation. The aim of our study was to determine whether maternal exercise before and during pregnancy would alleviate high fat diet-associated glucose and insulin resistance in high fat fed pregnant mice. Using C57BL/6 virgin female mice as a model, we fed the animals either a low fat diet (LFD; 10% kcal from fat) or a high fat diet (HFD; 45% kcal from fat) for twelve weeks, with an exercise intervention after four weeks (HFD+Ex), and pregnancy initiation after eight weeks of diet consumption. Glucose and insulin tolerance tests were performed at day 15 of gestation. Prescribed diet and exercise (or sedentary) behavior continued throughout pregnancy until animals were sacrificed at the 19th day of gestation. The HFD animals experienced a significant increase in body weight, along with increased numbers of calories consumed per day, and exercise further increased body weight and food intake. Both the HFD and the HFD+Ex animals displayed impaired glucose and insulin tolerance testing when compared with the LFD animals. Interestingly, exercise improved serum insulin levels at termination. mRNA expression of genes involved in fatty acid and glucose metabolism were upregulated in the HFD+Ex animals compared with the HFD mice. Our study exhibits that the development of adiposity from the consumption of a high fat diet prior to pregnancy leads to detrimental maternal effects during late gestation, including higher body weight, and glucose tolerance. Surprisingly, the addition of exercise did not alter dam morphology or gestational glucose tolerance; however, it did improve serum insulin levels and metabolite handling in the heart.