JURA
Journal of Undergraduate Research in Alberta

UNIVERSITY OF CALGARY

METABOLIC EFFECTS OF DIET INDUCED OBESITY

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INTRODUCTION

Obesity is generally defined as a condition where excess body fat has accumulated to a point where it can cause detrimental health effects [1]. Obesity in children and teenagers is becoming more common, with worldwide rates increasing by 50% in the last 30 years [2]. The purpose of this project was to investigate how inducing obesity through a high-fat/high-sugar (HFHS) diet affects a variety of metabolic, physical, and behavioral factors when utilizing a rat model to study dietary-induced obesity. To our knowledge, an in depth analysis of metabolic parameters using this model has not been conducted based on the current literature. Expected observations included an increased caloric intake for the obese animals and no change in caloric expenditure between groups, accompanied by a decrease in activity for the obese animals once the animals began to show signs of increased fat mass.

METHODS

Twenty male Sprague Dawley rats were randomly divided into two groups of ten at three weeks of age (post-weaning). The control group was fed regular rat chow and the experimental group was fed a custom HFHS diet in order to induce obesity. Both groups were provided with food ad libitum.

From weaning until 16 weeks of age, each rat spent one period of at least 24 hours in a metabolic chamber per week. The metabolic chambers were set up to monitor a variety of parameters. These included gas exchange (caloric expenditure), food consumption, and activity levels. Data collection is ongoing, therefore statistics have been run based on the latest time point at which data has been collected for all animals.

RESULTS

Shown in Figure 1, the experimental group of rats which were fed the HFHS diet consumed significantly more calories than the control group for each week after the first two. Interestingly, there was no statistical significance between the mass of food consumed by each group. There was also no statistical significance between the mass of the two groups over the time period we tested. In addition to this, we also found that at 10 weeks of age the experimental group expended over 25% more calories ($p<0.001$) when compared to the controls, and the caloric expenditure was significantly higher for the experimental group for all but the first week. The experimental group was significantly more active ($p<0.05$) for weeks five through eight.

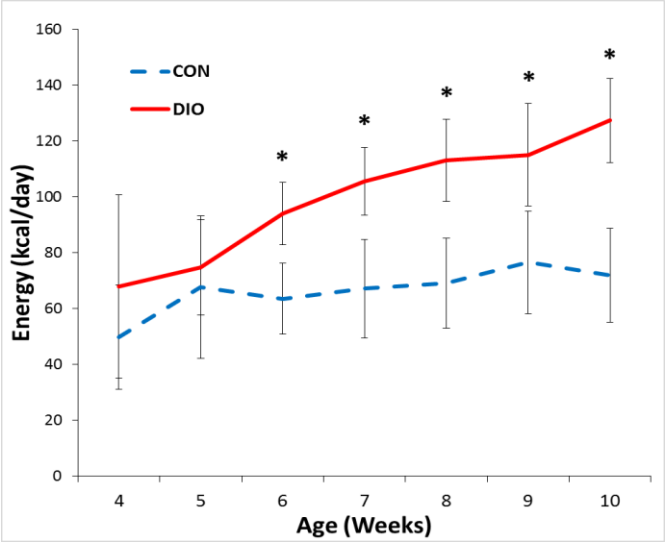

Figure 1: Daily caloric intake over the first 7 weeks on each diet (10 weeks of age). CON=control group, DIO=diet induced obesity group. Statistical significance ($p<0.05$) is represented by an asterisk.

DISCUSSION AND CONCLUSIONS

The experimental animals did not become heavier than the controls to the extent that was expected. Despite this, there was still increased caloric intake relative to the controls. The experimental group also had significantly higher energy expenditure compared to the controls, potentially as a result of higher activity levels, which was unexpected and may help explain the minimal weight gain. Testing will continue until 16 weeks of age, at which point we expect to see statistical significance for body mass based on the way the data is trending.

REFERENCES

1. Navaneelan and Janz. *Health at a Glance*. **4**:1-10, 2014.
2. World Health Organization. *Obesity and Overweight Fact Sheet 311*. 2011.