# Does Snacking-Induced Obesity Impact Metabolic Rate and GI Tract Function in Female Rats?

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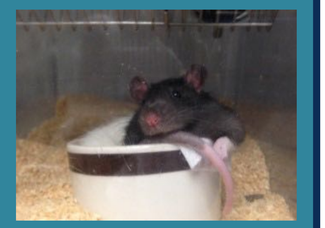
Dr. Helen I'Anson • Washington and Lee University • Summer 2018



## INTRODUCTION

- Obesity has reached epidemic levels the in United States (1 in 3 adults and 1 in 5 children are obese).
- Obesity leads to health issues e.g., diabetes, heart and liver disease, and metabolic syndromes.
- In previous studies:
  - Control rats were gaining less weight while eating more calories suggesting an altered metabolism.
  - Snacking rats had a significant decreased glucose absorption in the stomach after a glucose gavage indicating a compromised GI tract.

## HYPOTHESIS

- We hypothesize that:
  - Metabolic rate of the snacking rats will decrease more rapidly over time than in control rats.
  - Structure and function of the GI Tract will be compromised as a result of snacking-induced obesity.

## MATERIALS AND METHODS

Female Long Evans rats arrived at 21 days old (N=18)

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Rats were separated into control and snacking groups at 22 days old (n=8)

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Both groups received *ad libitum* chow and water

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The snacking group also received snacks of Sandies, Tostitos, Peanut Butter Chips

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Metabolic rate and gut permeability were tested on alternating weeks

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Termination occurred on Days 78-79

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Fat pads, liver, brain, and GI tract tissues were harvested for analysis

## RESULTS

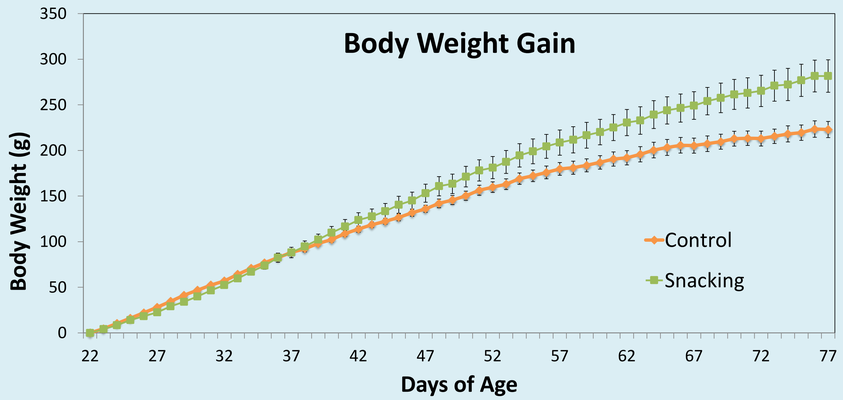


**Figure 1**: Control and snacking rats had similar net body weight gains from Day 21 to Day 37. From Day 37 onwards, body weight increased more rapidly in snacking rats compared with control rats.

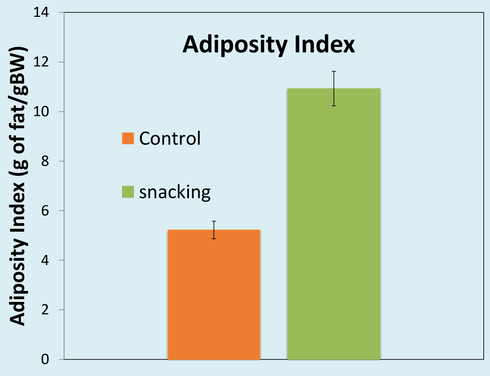


**Figure 2**: The snacking rats had a significantly greater adiposity index compared with control rats. The adiposity index used retroperitoneal, parametrial, and mesenteric fat in the calculation.

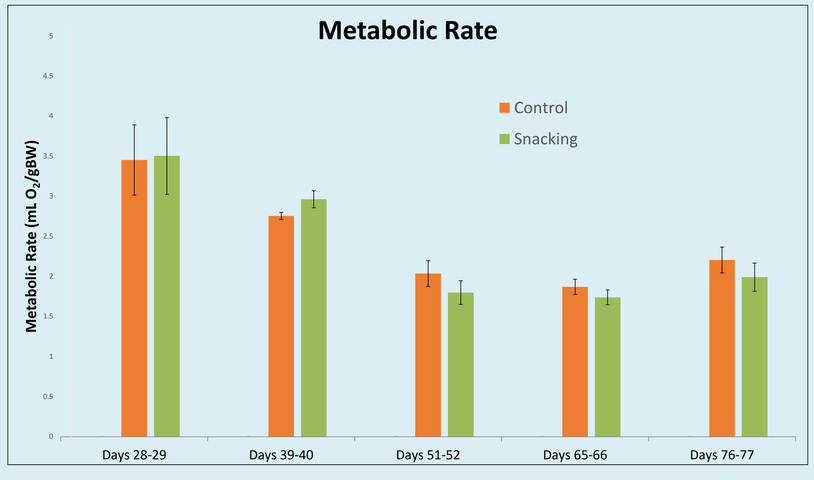


**Figure 3**: The metabolic rate of both groups of rats decreased over time. Metabolic rate increased slightly on Days 76-77. There was no difference between control and snacking rats.

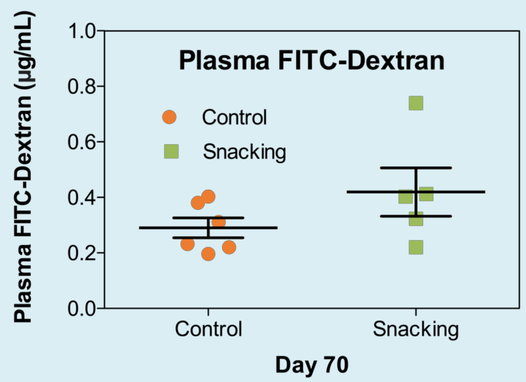


**Figure 4:** On Day 70, control and snacking rats did not show any significant difference in gut permeability, as indicated by plasma FITC-Dextran levels.

## Conclusions

- Snacking rats gained more weight than control rats after Day 37.
- Snacking increased abdominal fat deposits as indicated by a higher adiposity index in comparison to the control diet.
- Diet-induced obesity due to snacking did not result in a decrease in metabolic rate, despite an increase in abdominal fat. Therefore, the change in energy partitioning is not due to a change in metabolic rate.
- Snacking did not result in a significant increase in gut permeability compared to control rats. Small animal numbers and variability make this a tenuous conclusion.

## Future Work

- Tissue analysis of fat pads, liver, brain, and the GI tract to determine gene expression of metabolic pathways.
- Immunocytochemistry of GI tract regions to determine abnormalities that have been linked with diet-induced obesity.

## References

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