

Salt-Mediated Reduction of Weight Gain in Sprague- Dawley Rats

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The Obesity Epidemic

- ▶ Estimated 35% of adult US population is obese¹
 - ▶ Can lead to cardiovascular disease, stroke, type II diabetes, and more²
- ▶ Estimated that the average American consumes >2x recommended daily salt³
- ▶ Commonly thought that salt contributed to weight gain
- ▶ More recent studies have shown otherwise



1. Flegal et al., 2012. *JAMA*.
2. Lee et al., 2005. *Curr. Diab. Rep.*
3. Anonymous, 2010. *Public Health*.

Experimental Diets



Control

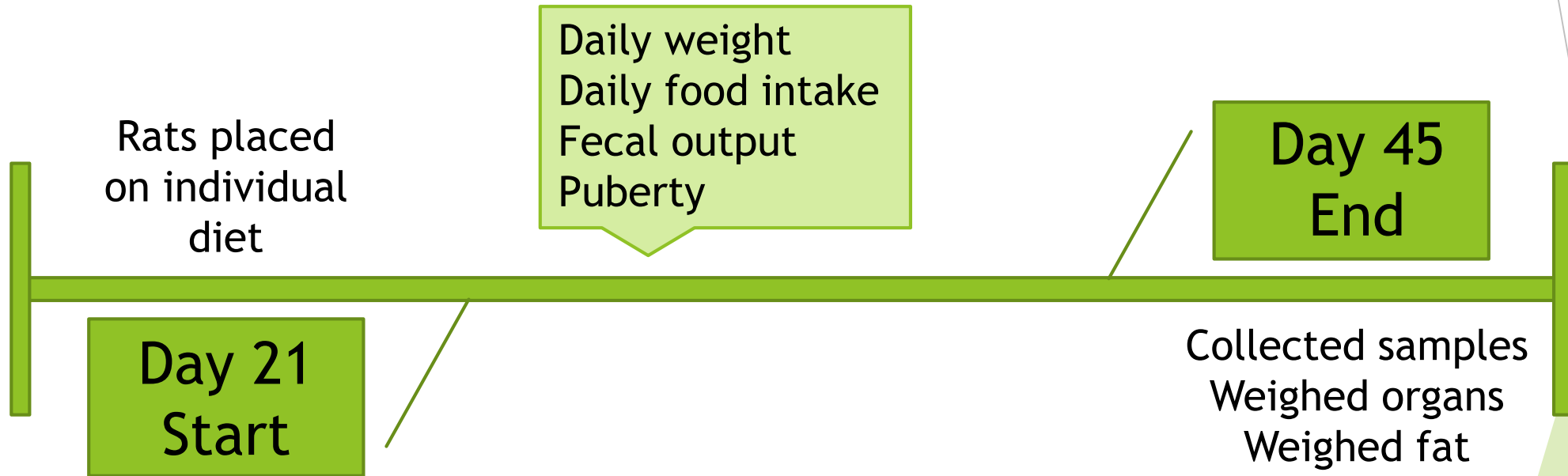
High Salt

High Fat

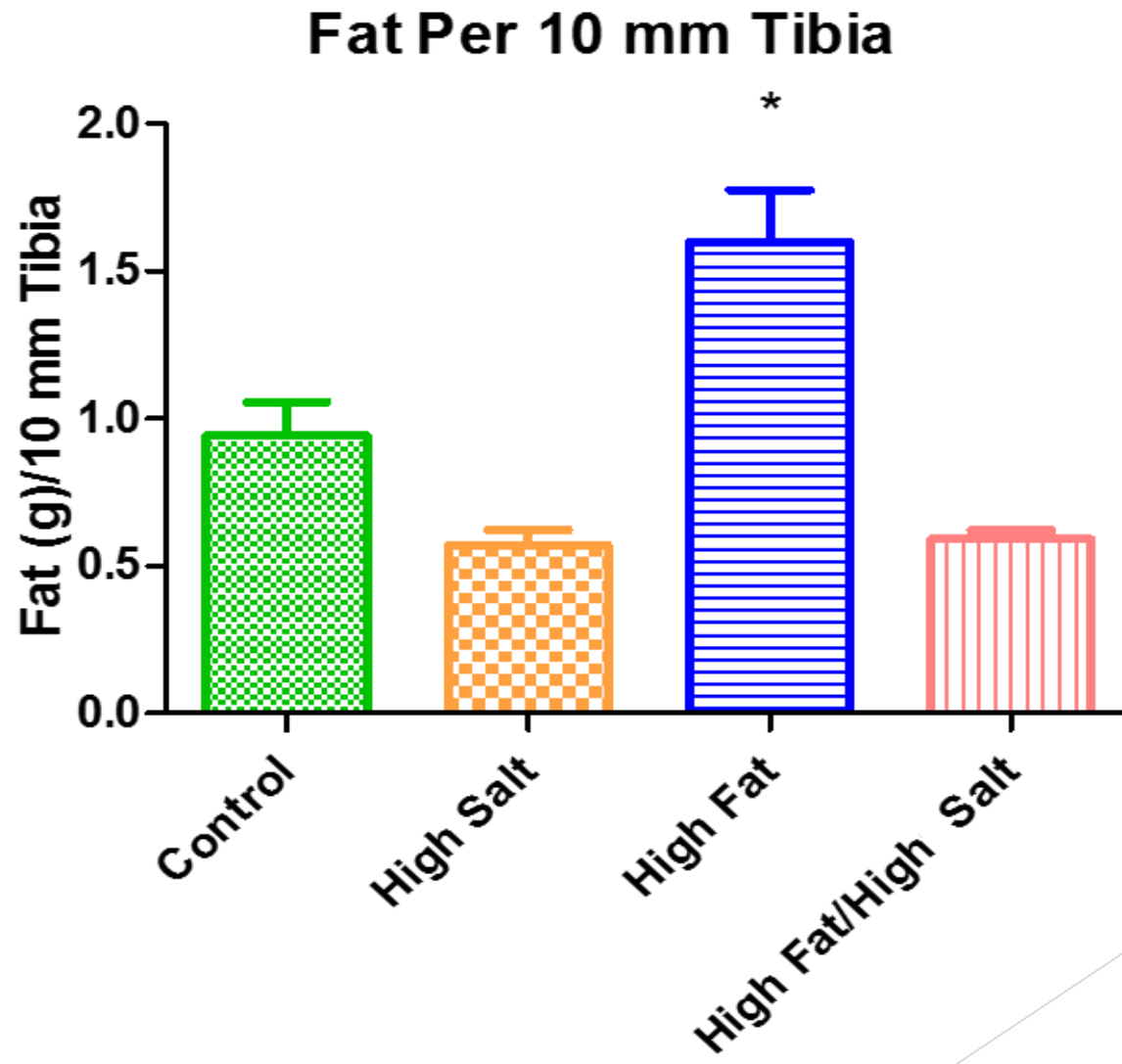
High fat/High Salt

- ▶ Control: 10% kcal fat, 0.3% salt
- ▶ High salt: 10% kcal fat, 8% salt
- ▶ High fat: 60% kcal fat, 0.3% salt
- ▶ High fat/high salt: 60% kcal fat, 8% salt

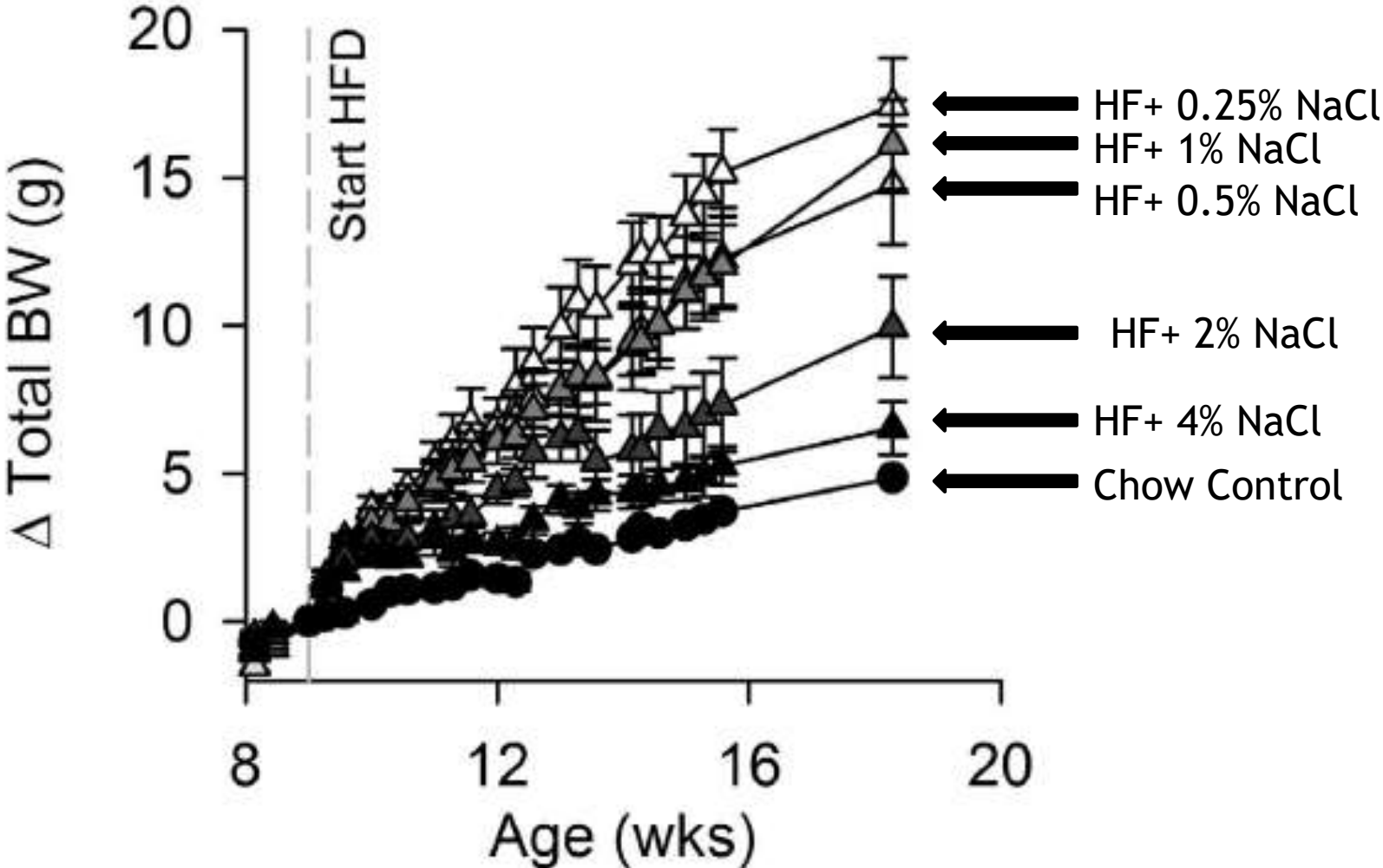
Experimental Design



High salt reduces weight gain in animals fed high fat



Similar results found in other labs



Weidemann et. al, 2015. *Scientific Reports*.

Calories
Eaten

Inputs



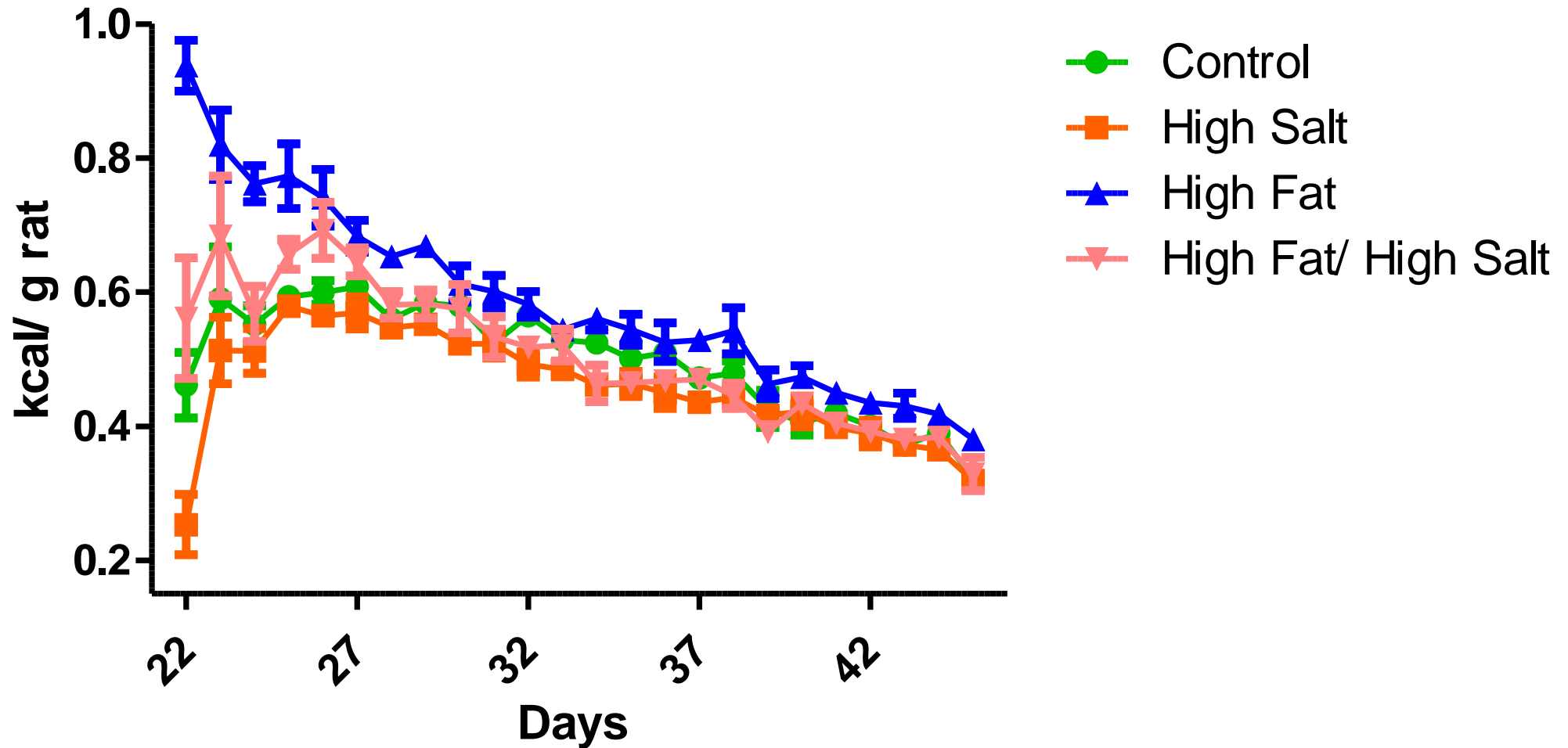
Outputs



Energy Available
for Weight Gain

Metabolism
Fecal Caloric Output
Exercise

HF/HS is not eating less calories

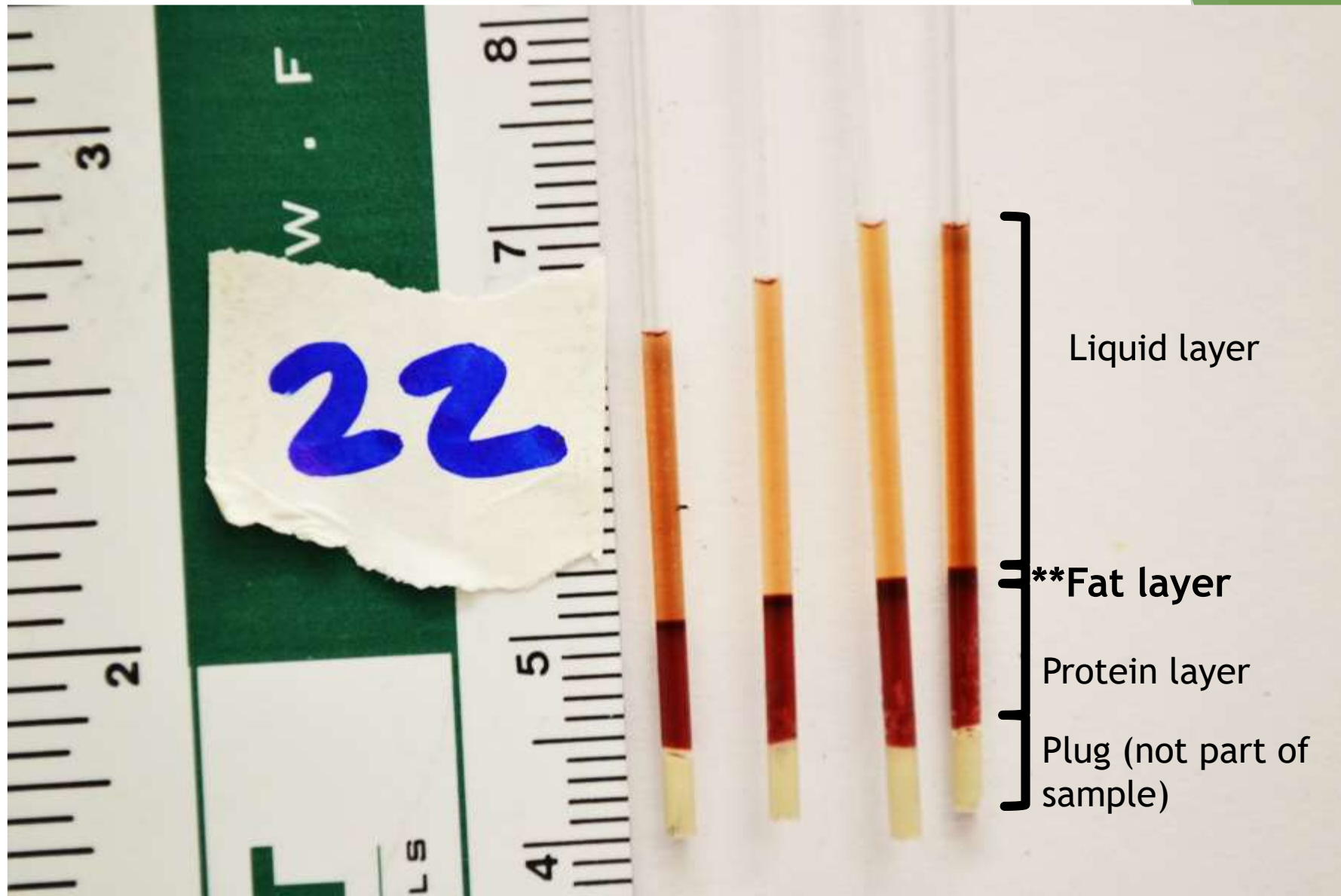


My Research Hypotheses

- ▶ Is HF/HS group excreting more fat through their feces?
 - ▶ Fecal Acid Steatocrit Analysis
 - ▶ Basic measure of fat percentage in feces
- ▶ Does HF/HS group have a reduced digestive efficiency?
 - ▶ Bomb Calorimetry
 - ▶ Measures calories in feces

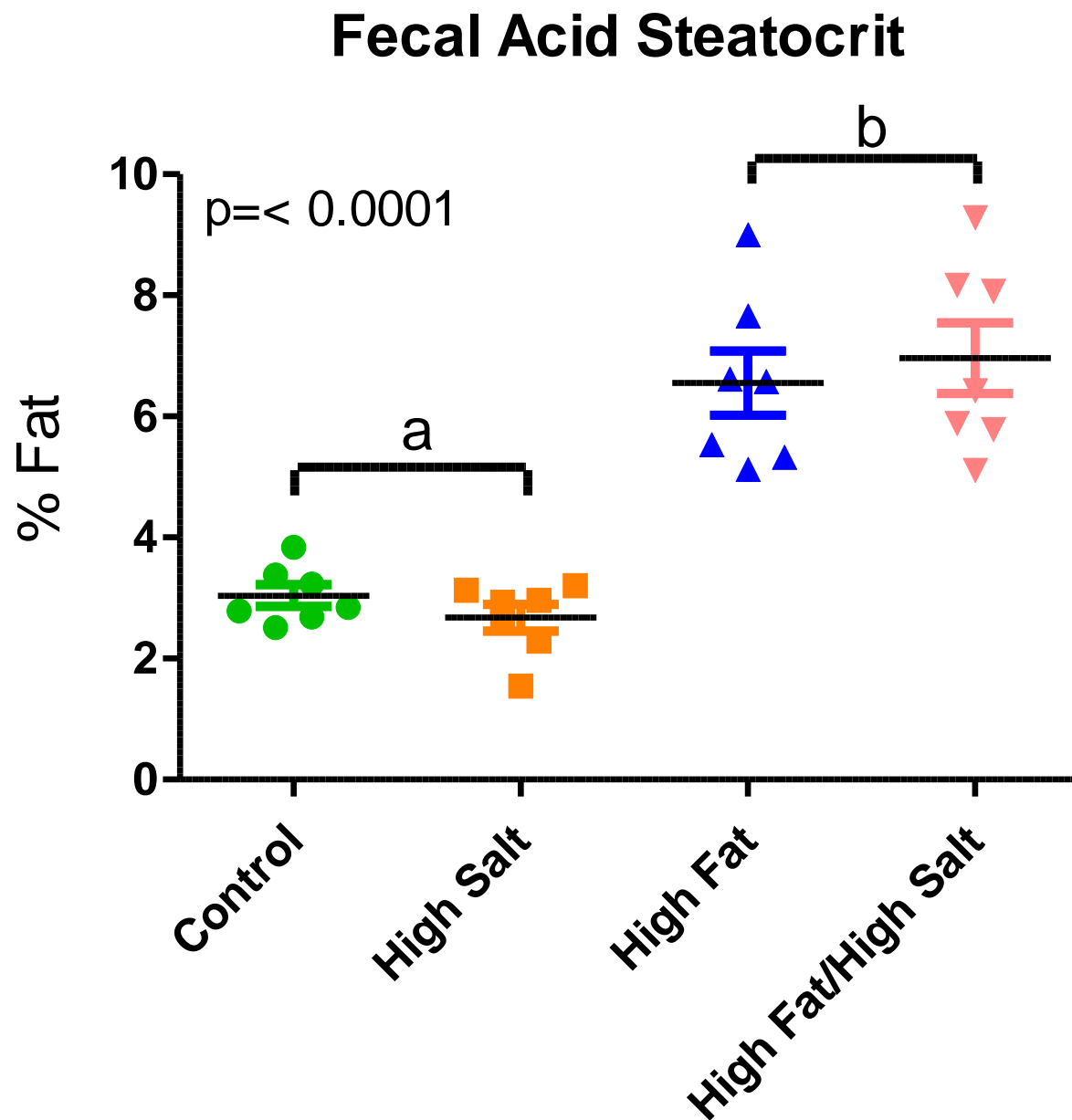
Fecal Acid Steatocrit Analysis

- ▶ Used to examine the proportion of fat in the feces
- ▶ Used freeze-dried fecal matter
- ▶ 50 mg crushed and combined with Oil-Red-O
 - ▶ Stains fat red
- ▶ Centrifuged



- ▶ ImageJ used to calculate the proportion of red-stained oil layer to total sample

HF/HS does not excrete significantly more fat than HF group



Groups a and b are significantly different

Digestive Efficiency

- ▶ Ratio of how well ingested calories are used for growth

Daily Caloric Intake - Daily Fecal Caloric Excretion = Caloric Uptake

Caloric Uptake ÷ Weight Gain = **Digestive Efficiency**

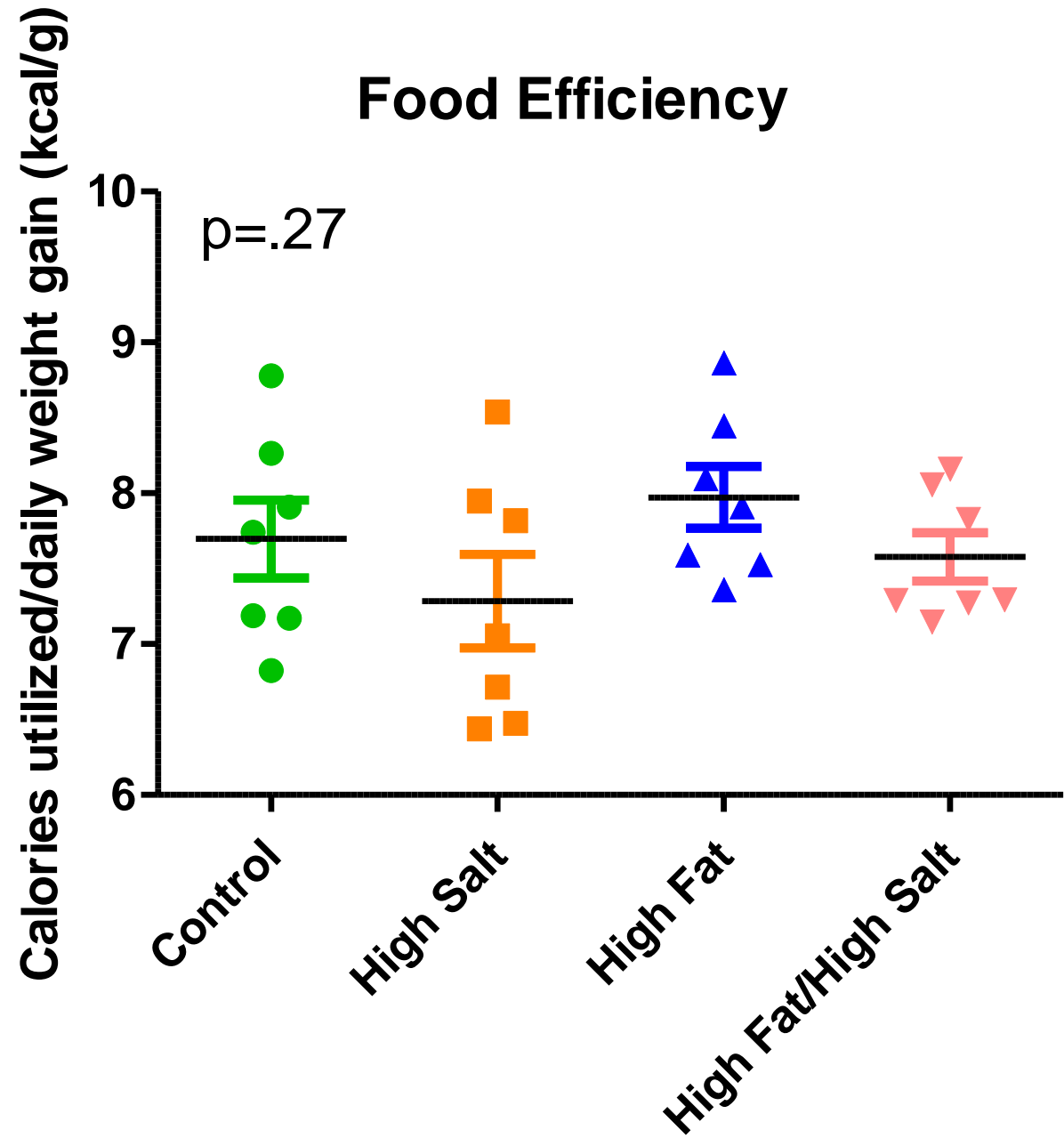
Digestive Efficiency

- ▶ We know:
 - ▶ Average daily caloric intake
 - ▶ Average daily weight gain
 - ▶ Average daily fecal excretion
- ▶ Use bomb calorimetry to accurately determine how many calories are excreted in the feces per gram

Bomb Calorimetry



HF/HS does not have a lower digestive efficiency



Conclusions

- ▶ HF/HS does not excrete more fat
- ▶ HF/HS does not have a lower digestive efficiency
- ▶ Other possible mechanisms
 - ▶ Increased activity
 - ▶ Increased temperature
- ▶ Obesity and salt have a more complex relationship than previously thought!

Acknowledgments & Future Plans

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