Female Mouse Model to Investigate Effects of High Fat Diet on Blood Pressure Prior to Pregnancy

LSU Health NEW ORLEANS School of Medicine

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Introduction

Maternal health plays a significant role in the prenatal and postnatal development of a child's physiology.

- Women of reproductive age often consume calorie-dense foods, which contributes to the development of adipose tissue.[1]
- It has been reported that **increased adipose tissue** correlates with greater formation of **angiotensin II**, which acts as vasoconstrictor to increase blood pressure and cardiac output, which **contributes to hypertension**.[2] Therefore, diet-induced obesity may be a risk factor for hypertension.
- To test this hypothesis, this study is developing a mouse model, wherein diet can be tightly controlled, to discover links between high fat diet and hypertension in female mice prior to pregnancy.

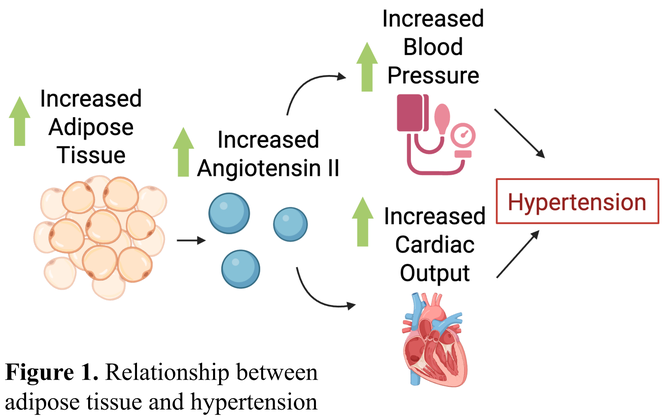


Figure 1. Relationship between adipose tissue and hypertension

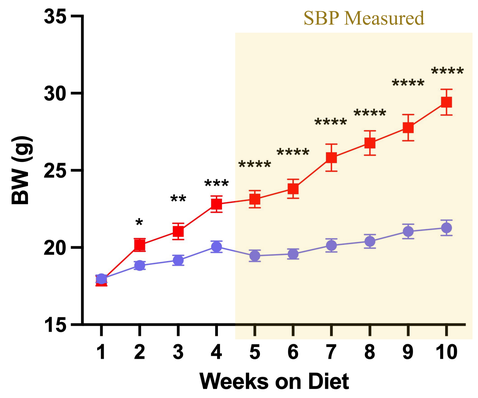
Objective

This study evaluates the use of a non-invasive method to monitor blood pressure in pre-pregnancy female mice that are maintained on high fat or regular fat diets.

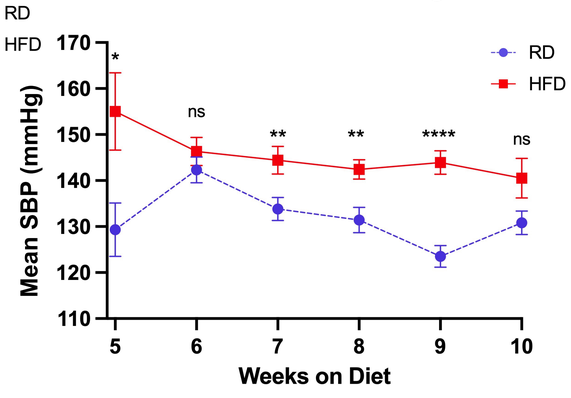
Results

Mean systolic blood pressure (SBP) measurements and body weight (BW) were consistently higher in mice with a high fat diet than those with a regular diet.

a Body weight (BW) of HFD mice were statistically greater than BW of RD mice from week 2 to 10.



b **Mean SBP Measurements of HFD mice were statistically higher than RD mice for 4 out of 6 weeks of recordings**



c There was variation in CODA High Throughput System readings

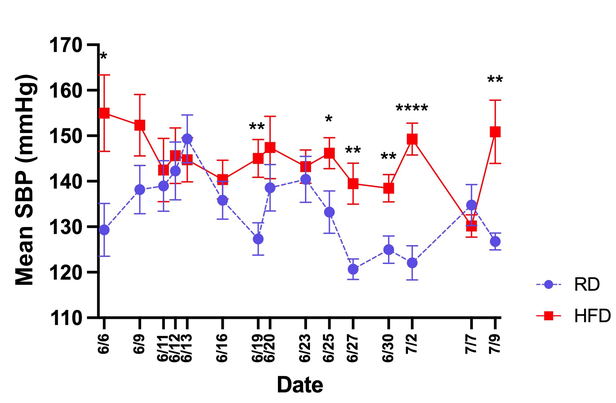


Figure 3. (a) Body weight over 10 weeks of diet. (b) Weekly mean SBP measurements over 6 weeks. (c) All mean SBP measurements through the summer

Systolic blood pressure measurements obtained by the CODA High Throughput System were higher than prior measurements by telemetry, an invasive technique.

Telemetry data from previous cohort (unpublished):

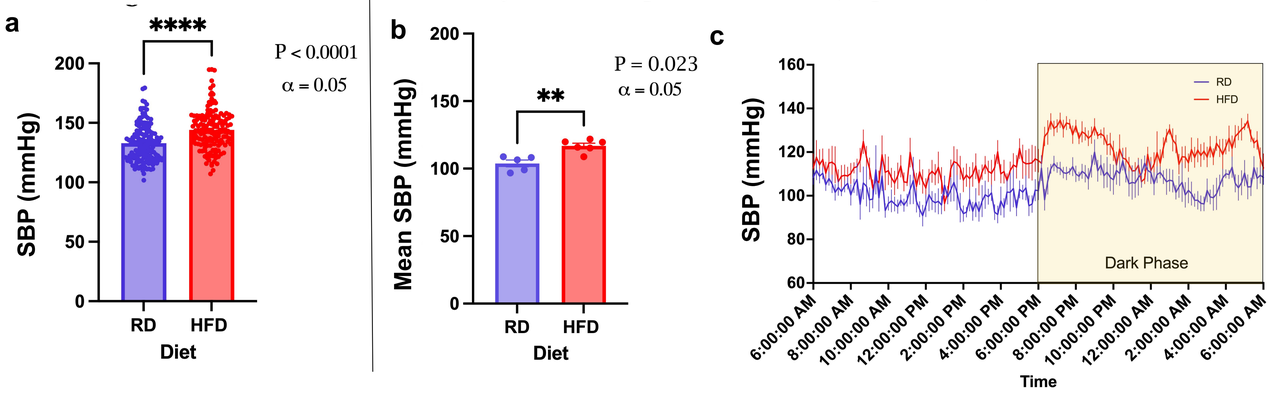


Figure 4. (a) All SBP measurements throughout 6 weeks. (b) Mean SBP Measurements from Individual Pre-Pregnancy Female Mice over 24 Hours from previous cohort. (c) SBP Tracing of Pre-Pregnancy Female Mice over 24 Hours from previous cohort

Methods

At 6 weeks of age, a cohort of 10 C57BL/6J female were fed high fat diet (HFD) mouse chow of **60 kcal% fat**, while—at the same age—another cohort of 10 C57BL/6J female mice were fed a regular diet (RD) of **22 kcal% fat**. After 5 weeks on their respective diets, systolic blood pressure (SBP) measurements were taken with the **CODA High Throughput System from Kent Scientific Corporation** to assess hypertension. A **SBP measurement ≥ 130 mmHg was considered hypertensive**. This study assessed SBP readings from week 5 to week 10; in addition, body weight changes were monitored weekly. Statistical comparisons between the HFD and RD mice were made with two-tailed t-tests at a 95% confidence level ($\alpha = 0.05$).

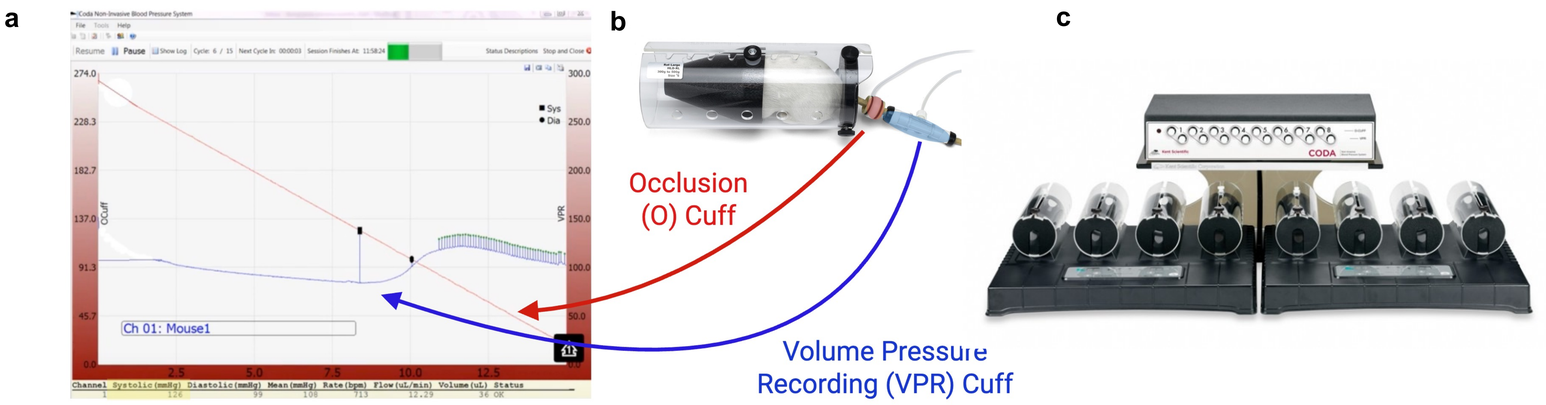


Figure 2. Example of CODA High Throughput System (a) blood pressure measurement and (b) animal holder with rat and cuffs. (c) Example equipment for CODA High Throughput System from Kent Scientific Corporation

Conclusions

- As compared with the method of telemetry, the **CODA High Throughput System** most likely introduced **stress, which elevated all BP measurements**.
- The data from this study supports an association between high fat diet and hypertension in female mice.
- **Next steps: The effects of HFD on the blood pressure of pregnant female mice and their progeny will be investigated.**

References

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2. Sharma A. M. (2004). Is there a rationale for angiotensin blockade in the management of obesity hypertension?. *Hypertension (Dallas, Tex. : 1979)*, *44*(1), 12–19. https://doi.org/10.1161/01.HYP.0000132568.71409.a2
3. Created in https://BioRender.com

This research project was supported through the LSU Health Sciences Center, School of Medicine.