

SEX DIFFERENCES IN BLOOD PRESSURE AND RENAL HANDLING OF SODIUM IN MICE ON A HIGH SALT AND HIGH FRUCTOSE DIET



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BACKGROUND

- Consuming high levels of fructose and salt plays a major role in the obesity epidemic and high level of hypertension among the population.¹
- Many studies have linked high salt consumption with hypertension.²
- Sharma et al has found important sex differences in the renal handling of fructose and its effect on sodium balance.³
- Understanding how high fructose and high sodium affect the kidney creates the potential for new hypertensive treatments

AIM OF STUDY

to investigate sex differences in blood pressure regulation and renal handling of sodium in mice eating a high fructose and salt (HSHF) diet and determine if females are protected from high blood pressure when on the HSHF diet.

METHODS

- Intact male and female mice (n=6/group) were collected and given a high-salt high fructose diet (4% salt chow with 20% fructose and 1% NaCl solution) for 30 days.
- Mice were placed individually in metabolic cages and urine was collected.
- Urinary Na⁺ excretion (NAE, mg/day) was determined from daily measurements of urine sodium concentration and volume
- Na⁺ intake (Nai, mg/day) was determined from daily food intake of 4% salt diet
- Daily blood pressure measurements were taken via the tail-cuff method
- Expression of sodium transport proteins were measured via real-time quantitative PCR.

RESULTS

- Both male and female mice had a statistically significant rise in blood pressure at week 4 as compared to baseline (p < 0.05)
- In the recovery week female systolic blood pressure remained elevated while males decreased significantly (p < 0.01, compared to females)
- Female mice showed high sodium retention during the HSHF period via the Nae/Nai ratio (62±5% vs 75±5%, p<0.001)
- Female mice had higher expression of all renal Na transporters besides NaPi (p=0.01)

Figure 1: Systolic Blood Pressure

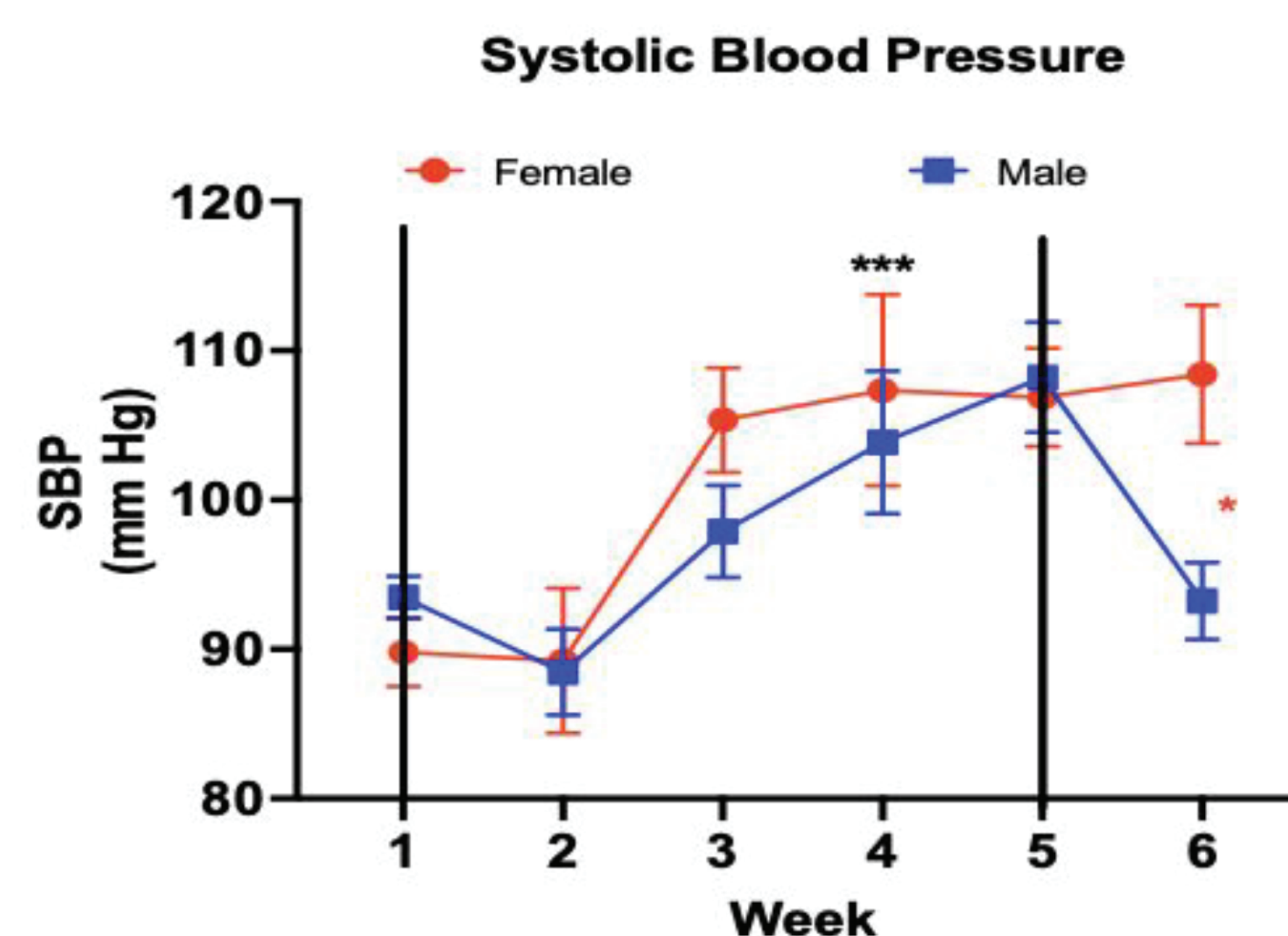
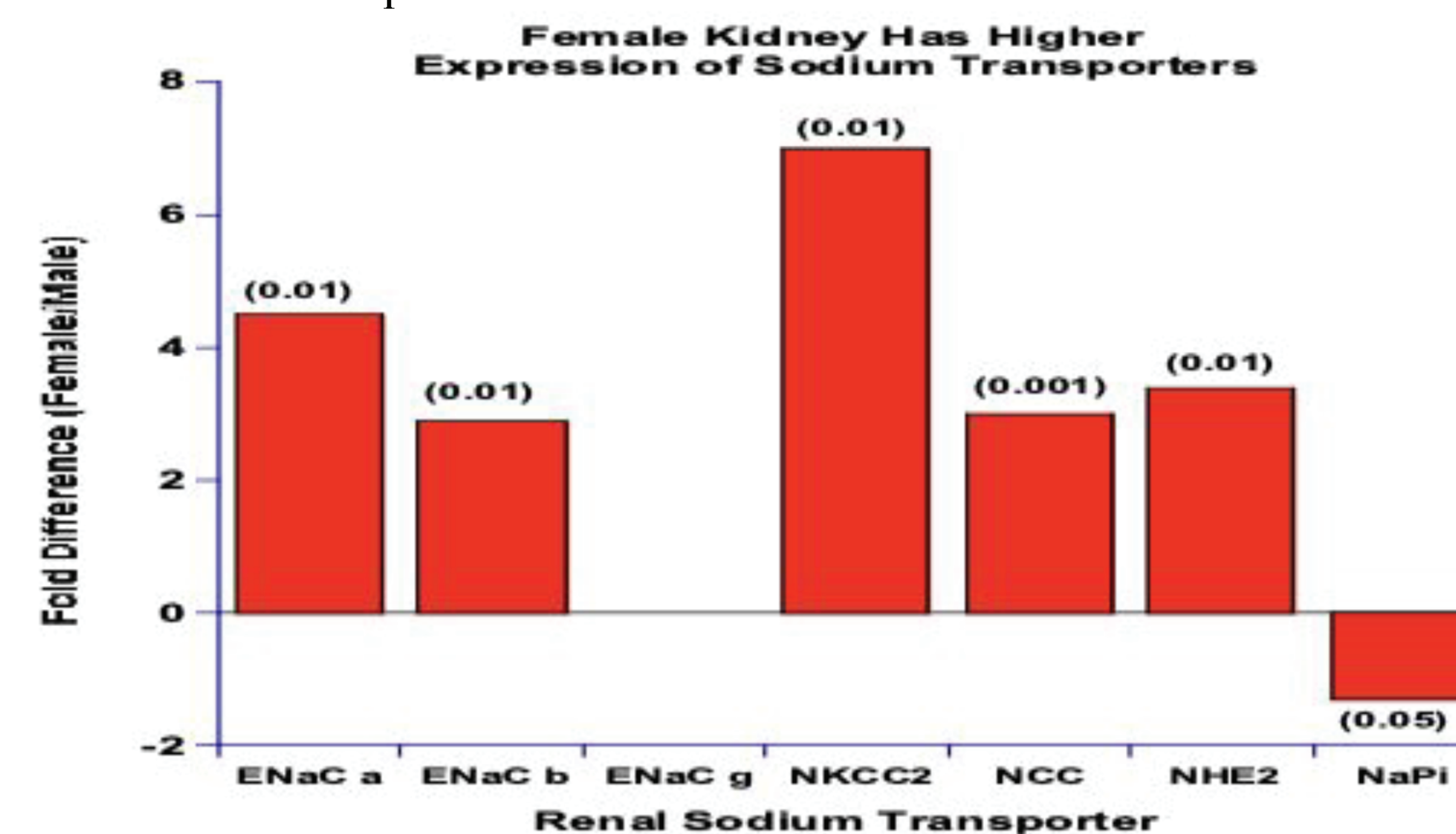


Figure 1 shows SBP (mmHG) in mice from baseline (Week 1) to the weeks where mice consumed the HSHF diet (Weeks 2 – 5) to the recovery week (Week 6). *** indicates the SBP was significantly different from baseline and Week 2. * indicates significant difference between male and female SBP in Week 6.

Figure 2 the relative fold expression (Female-to-Male) of the renal sodium transporters. Only one transporter (NaPi – sodium phosphate) showed lower expression in female kidney

Figure 2: Molecular Expression of Sodium Transporters



CONCLUSION

- Consuming the HSHF diet increased blood pressure in male and female mice and SBP trended higher in females in the second week. SBP in female mice remained higher after the recovery week whereas SBP decreased in male mice
- Sodium excretion and sodium balance were similar in male and female mice with female mice tending to retain more sodium than male mice.

SIGNIFICANCE OF FINDINGS

- Females are not protected from the high fructose and salt diet-induced increase in blood pressure.

REFERENCES

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