

Pre-loaded Betaine Supplementation on Thermoregulation and Biomarkers From Cycling Performance In Heat



Anissa Adams¹, Liliana Renteria¹, Brett Cross¹, Danny Eurich¹, Tim Griest¹, Cameron McCarthy¹, Kieran Paterson¹, Michael Ormsbee¹, Brandon Willingham²

¹ Florida State University, Tallahassee, FL.; ² Coastal Carolina University, Conway, SC

INTRODUCTION

Physical performance can be highly dependent on environmental conditions (e.g., temperature & humidity). Individuals experience significant decrease in their performance and endurance levels when under heat stress due to a decreased thermoregulatory response. Betaine as an osmolyte may mitigate the impact of heat on performance by raising a cell's cytoplasmic osmotic pressure and preventing protein denaturation in response to heat, and potentially decrease damage to enterocytes. As most betaine literature is based in animal models this study examines betaine's ability to increase heat tolerance in humans.

RESULTS

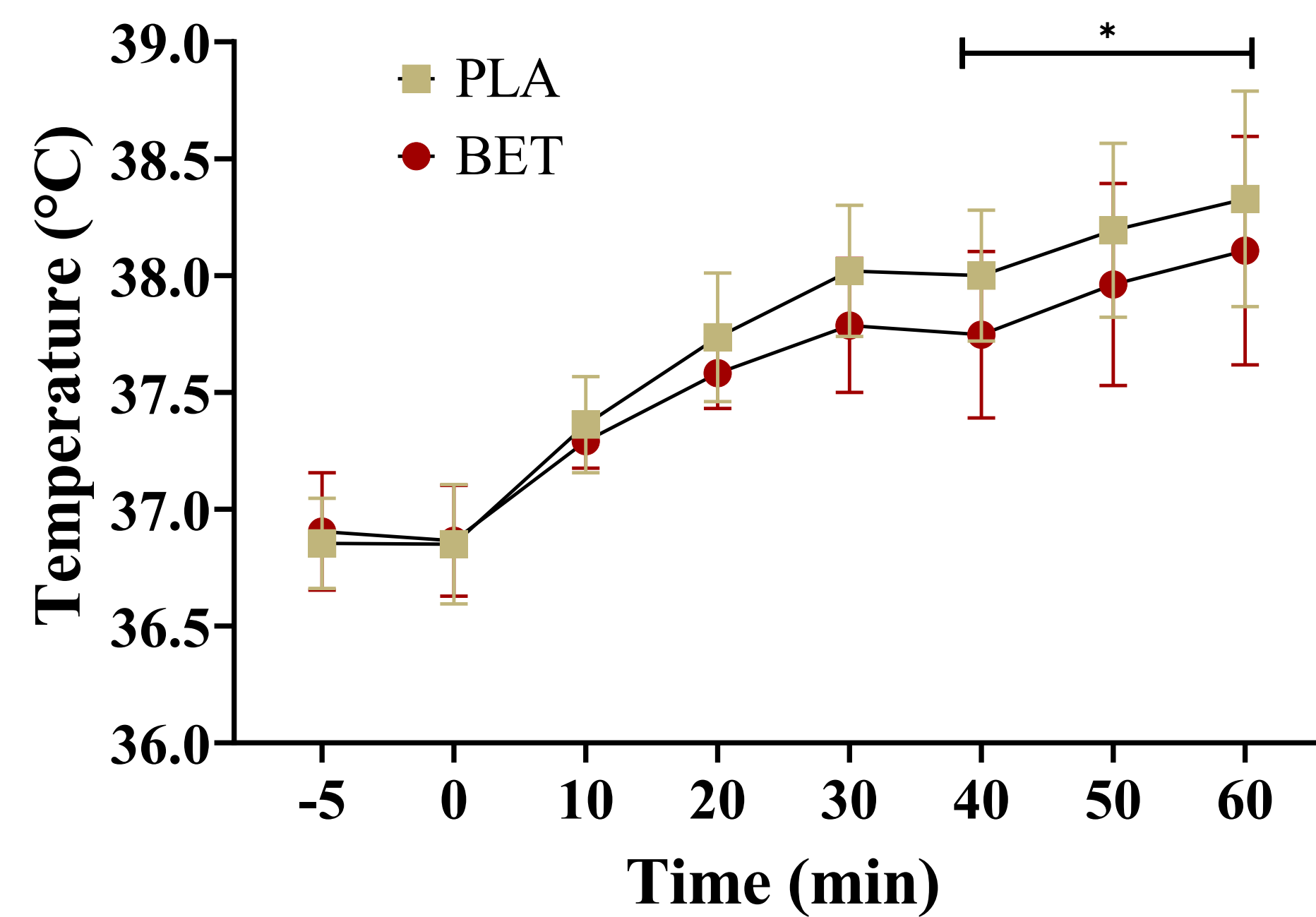


Figure 3. Core temperature measurements (C) in placebo vs. betaine groups

CONCLUSION

Betaine supplementation can:

- Have mitigating effects on rising core temperature (Figure 3)
- Potentially decrease protein denaturation due to excess heat
 - HSP70 levels remain steady (Figure 4)
- Lower effects of thermal stress on gut membrane integrity
 - Decrease presence of LPS proteins (Figure 5)

FUTURE DIRECTIONS

Betaine supplementation may be beneficial in the medical field as data suggests it can lower concentrations of lipopolysaccharides (LPS). LPS, indicative of gram negative bacteria, is known to increase as gut integrity becomes compromised, specifically as the gut barrier becomes highly permeable (leaky gut syndrome). The effects of leaky gut syndrome range from minor issues like bloating to chronic autoimmune diseases. Through betaine supplementation, gut integrity may be better maintained lowering the risk of developing leaky gut syndrome. This can prove important in populations experiencing chronic diseases, drug abuse, or undergoing radiation.

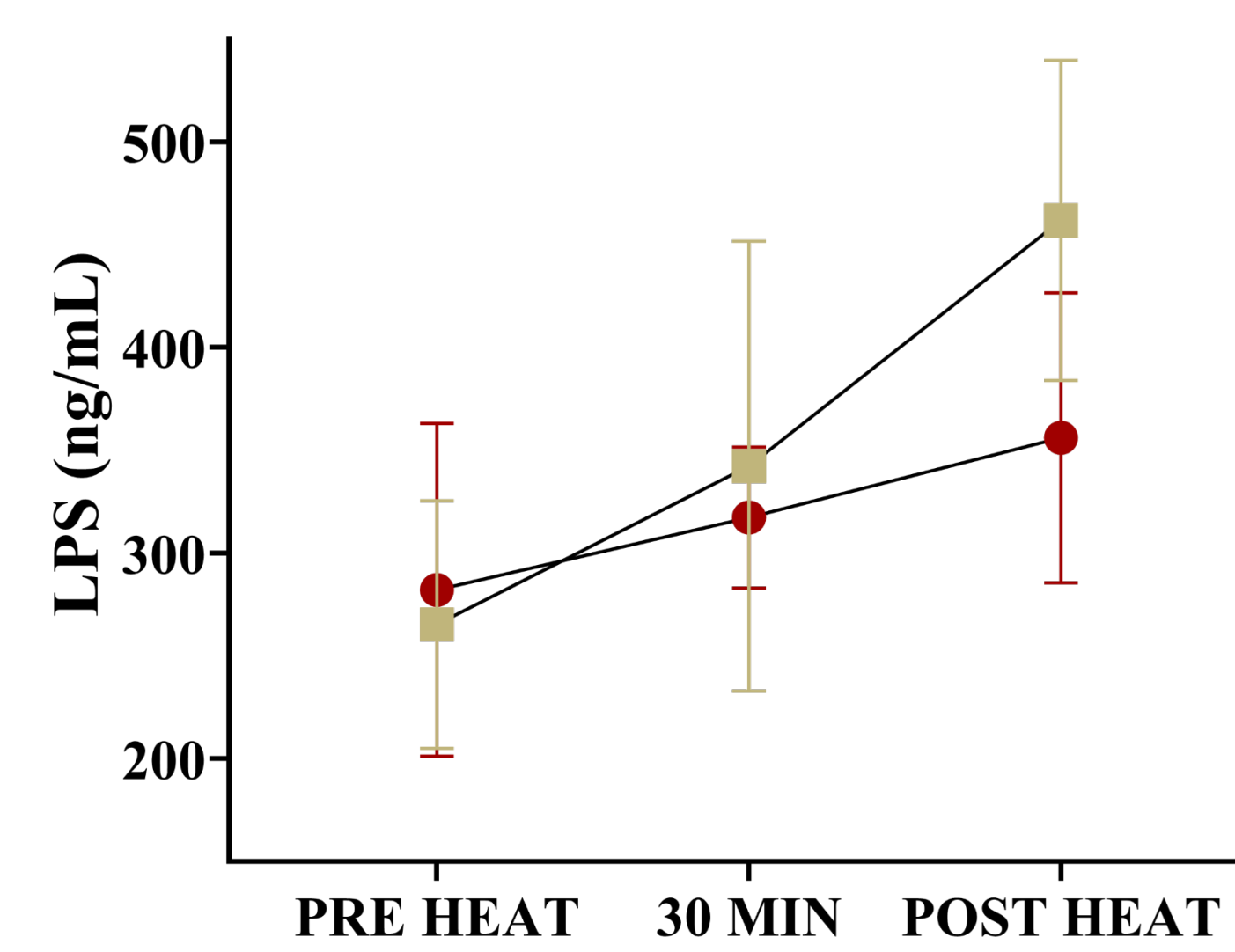
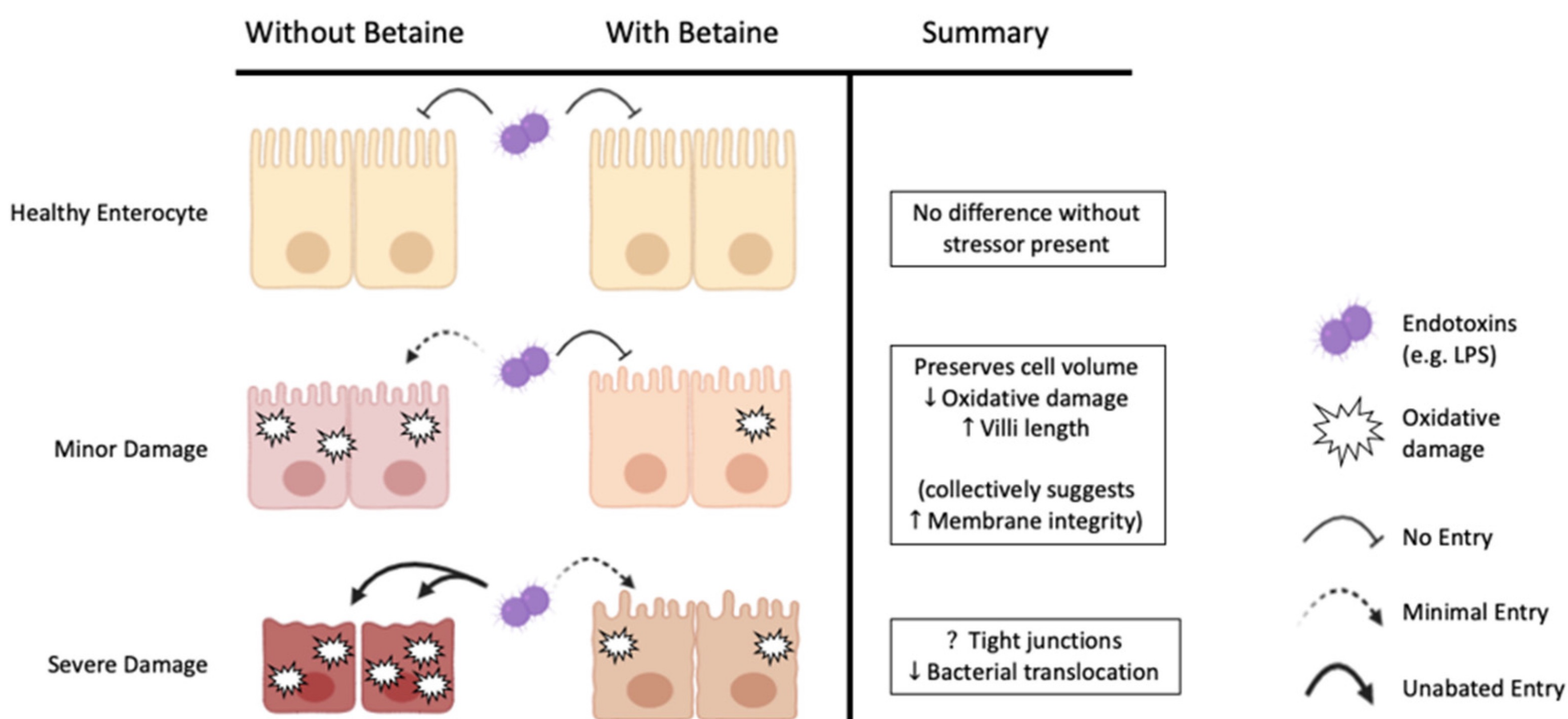


Figure 4. Concentration of Lipopolysaccharides in blood throughout experimental day

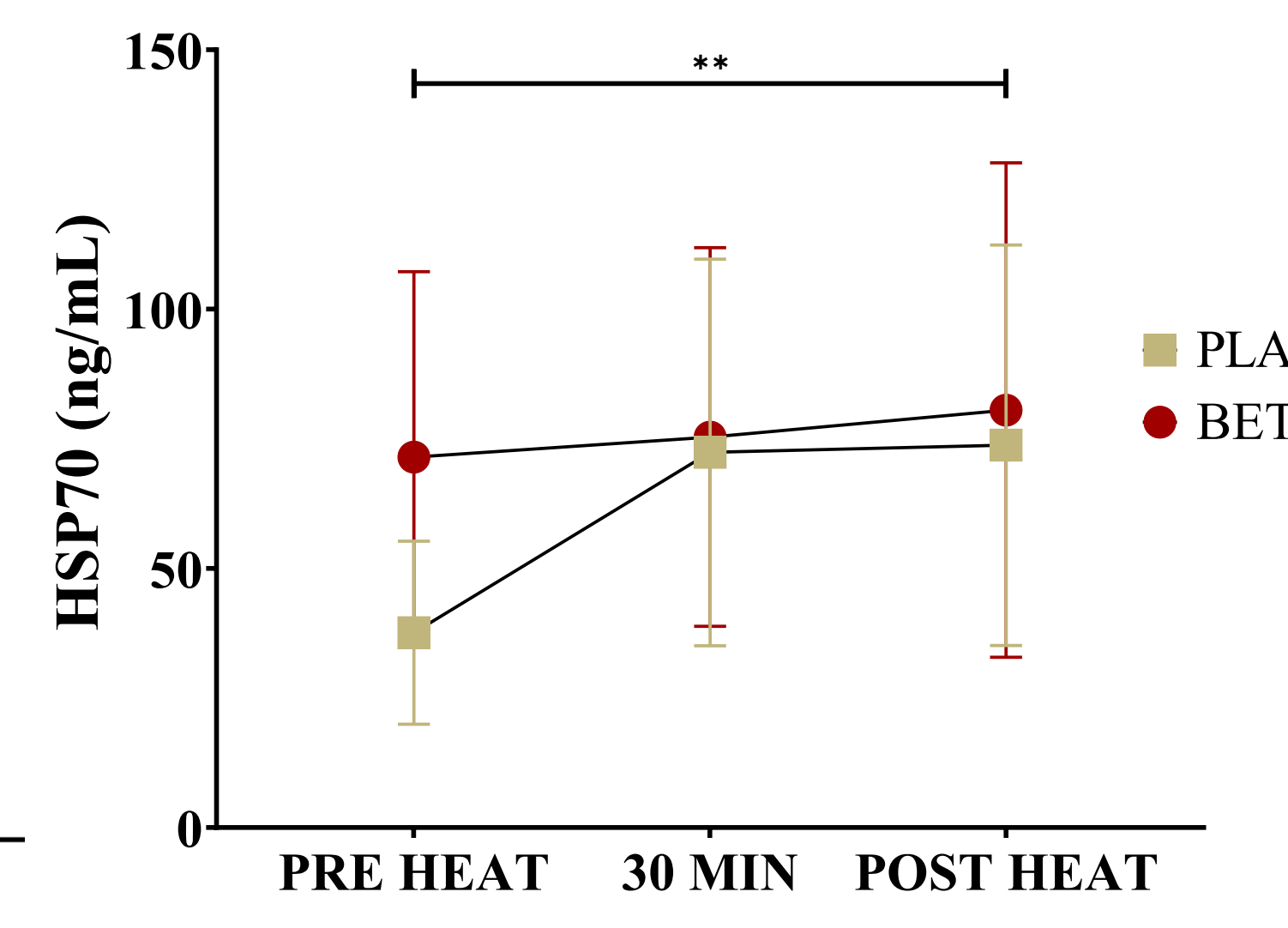


Figure 5. Concentration of Heat Shock Protein 70 in blood throughout experimental day

METHODS

- Double-blind, randomized, placebo-controlled, cross-over study
- 7 day washout period
- 6 endurance trained men: 23.3 ± 2.6 yrs; 179.23 ± 5.5 cm; 70.4 ± 9.3 kg; 54.4 ± 3.3 ml/kg/min

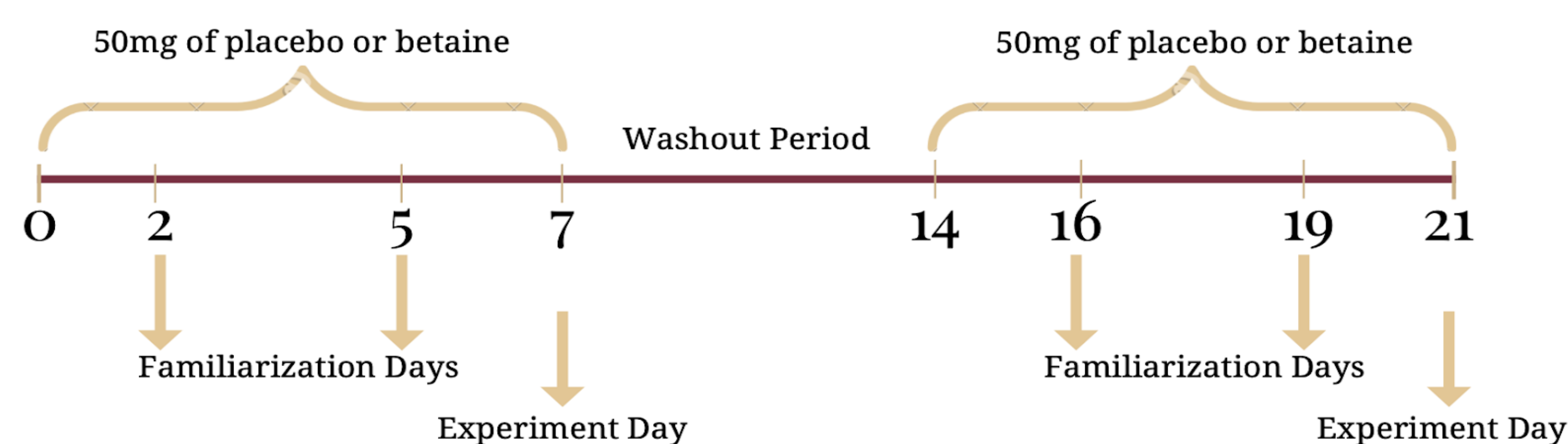


Figure 1. Overview of study timeline

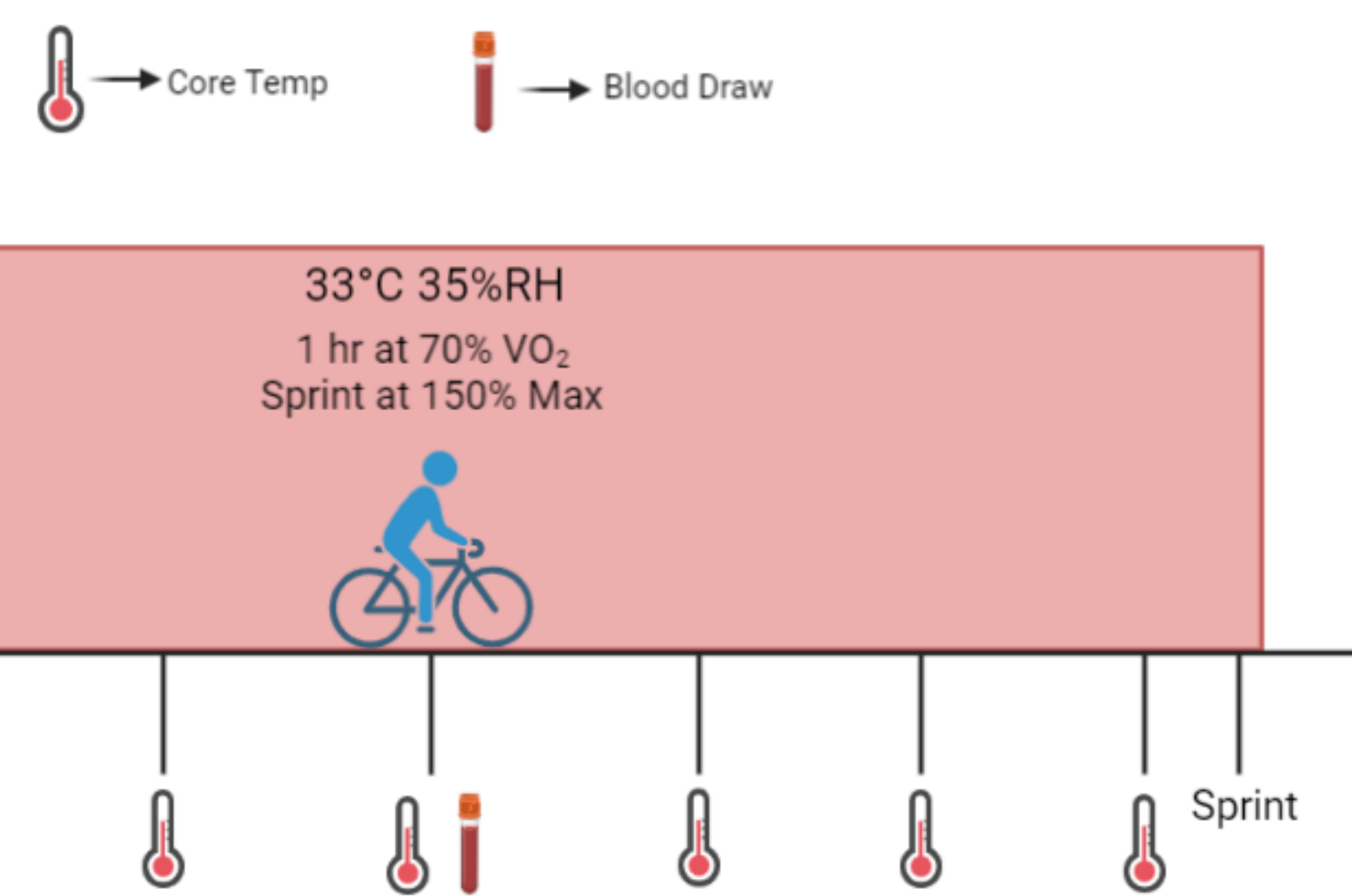


Figure 2. Timeline of experimental days 7 & 12

FUNDING/REFERENCES

Willingham BD, Ragland TJ, Ormsbee MJ.

Betaine Supplementation May Improve Heat Tolerance: Potential Mechanisms in Humans. *Nutrients*. 2020 Sep 25;12(10):2939.



This study was funded by NOW Foods.