



Validation of Rapid and Cheap Field Assessment in Gartersnakes

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Introduction

- Gartersnakes (*Thamnophis elegans* and *Thamnophis sirtalis*) leaving and entering hibernacula have been studied in the Logan area for several years from four distinct hibernaculum:
 - Cutler Marsh (least impacted)
 - Airport Drive (highly impacted by agriculture and automotive traffic)
 - Big Tree (impacted slightly by pedestrians)
 - Rendezvous Park (impacted by pedestrians)
- These populations have been monitored for capture stress response via corticosterone hormone concentrations. Corticosterone mobilizes energy by releasing glucose into the bloodstream.
- Our study validates testing blood glucose levels using a blood glucose meter and receiving the data immediately following blood sampling.
- We hypothesize that glucose levels will increase between baseline and stress-induced measurements.
- Further, we hypothesize that there will be differences between sites due to the varying levels of chronic stress.

Methods

- Samples were taken in Spring (n = 38) and Fall (n = 48) 2015 at the four sites.
- Blood was drawn before 3 min. for baseline glucose levels and 30 min. for stress response glucose levels.
- One drop of blood was placed on a blood glucose meter strip and levels were recorded
- Data was analyzed using t-tests and analysis of variance (ANOVAs). When applicable, pairwise comparisons were subjected to Bonferroni Correction.

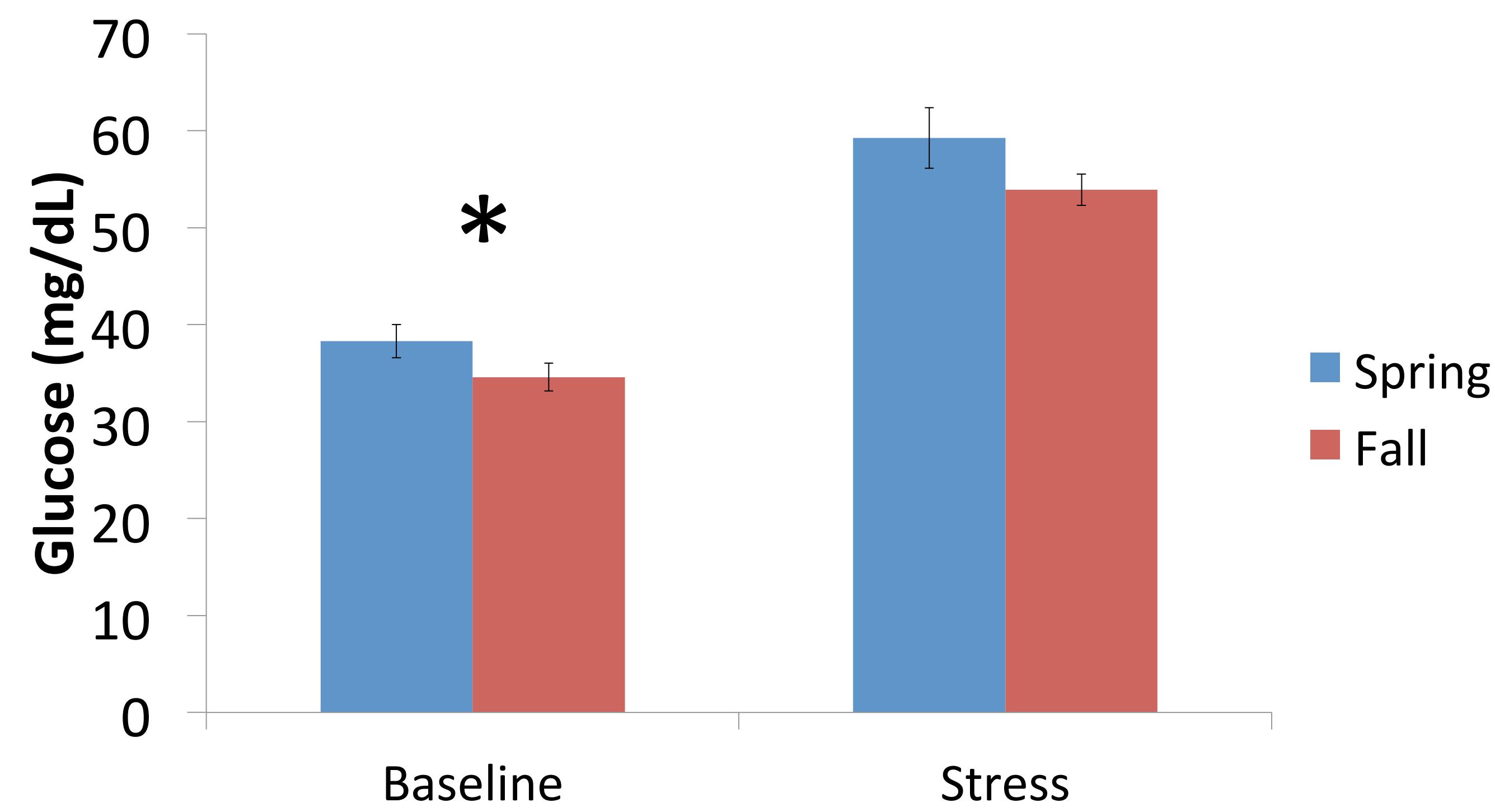


Figure 1. Baseline and stress-induced blood glucose levels in gartersnakes between Spring and Fall 2015. Asterisk indicates significant difference.

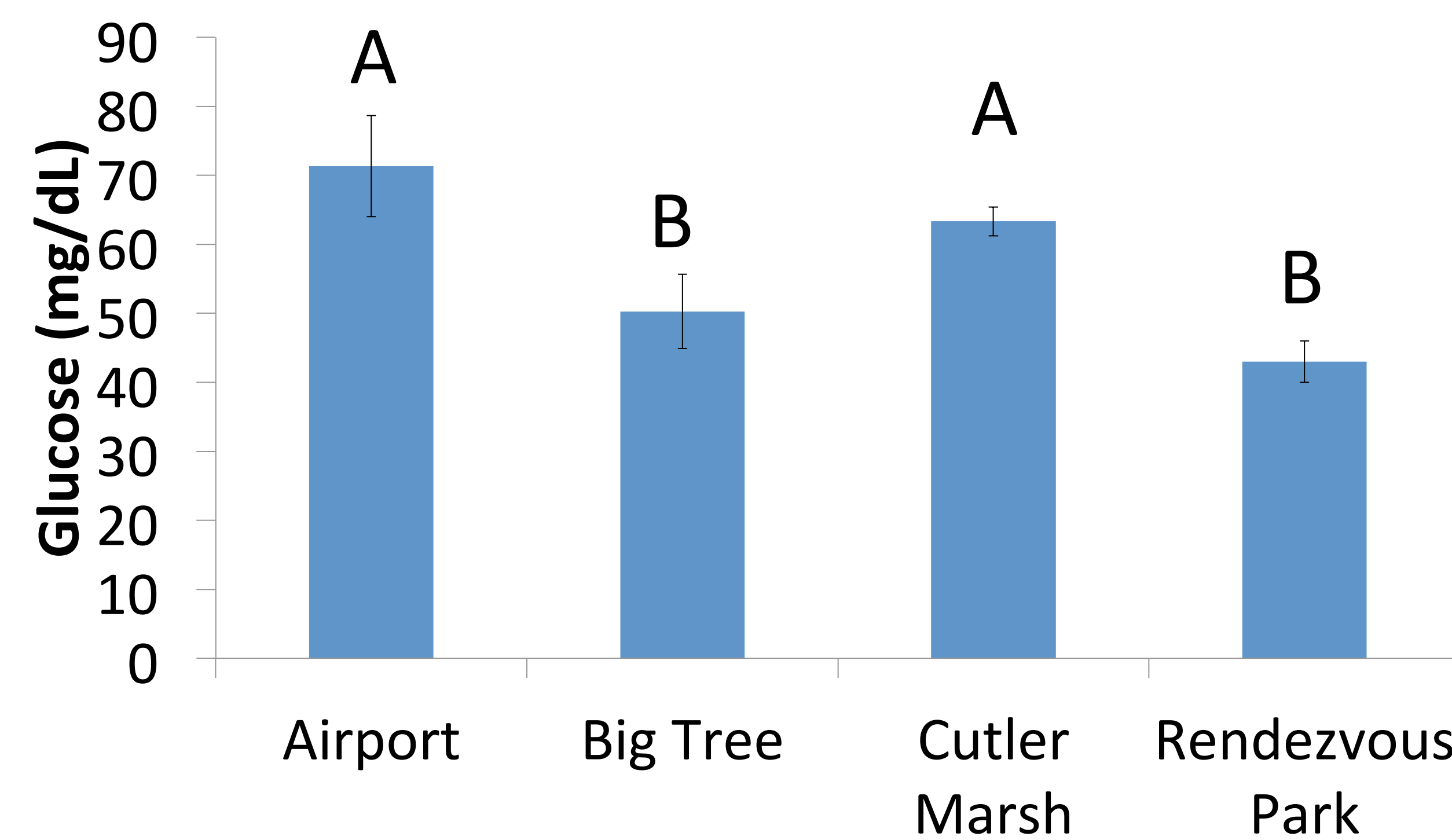


Figure 2. Stress-induced levels of glucose in gartersnakes at four sites in Cache Valley. Letters not connected are significantly different ($p < 0.05$).

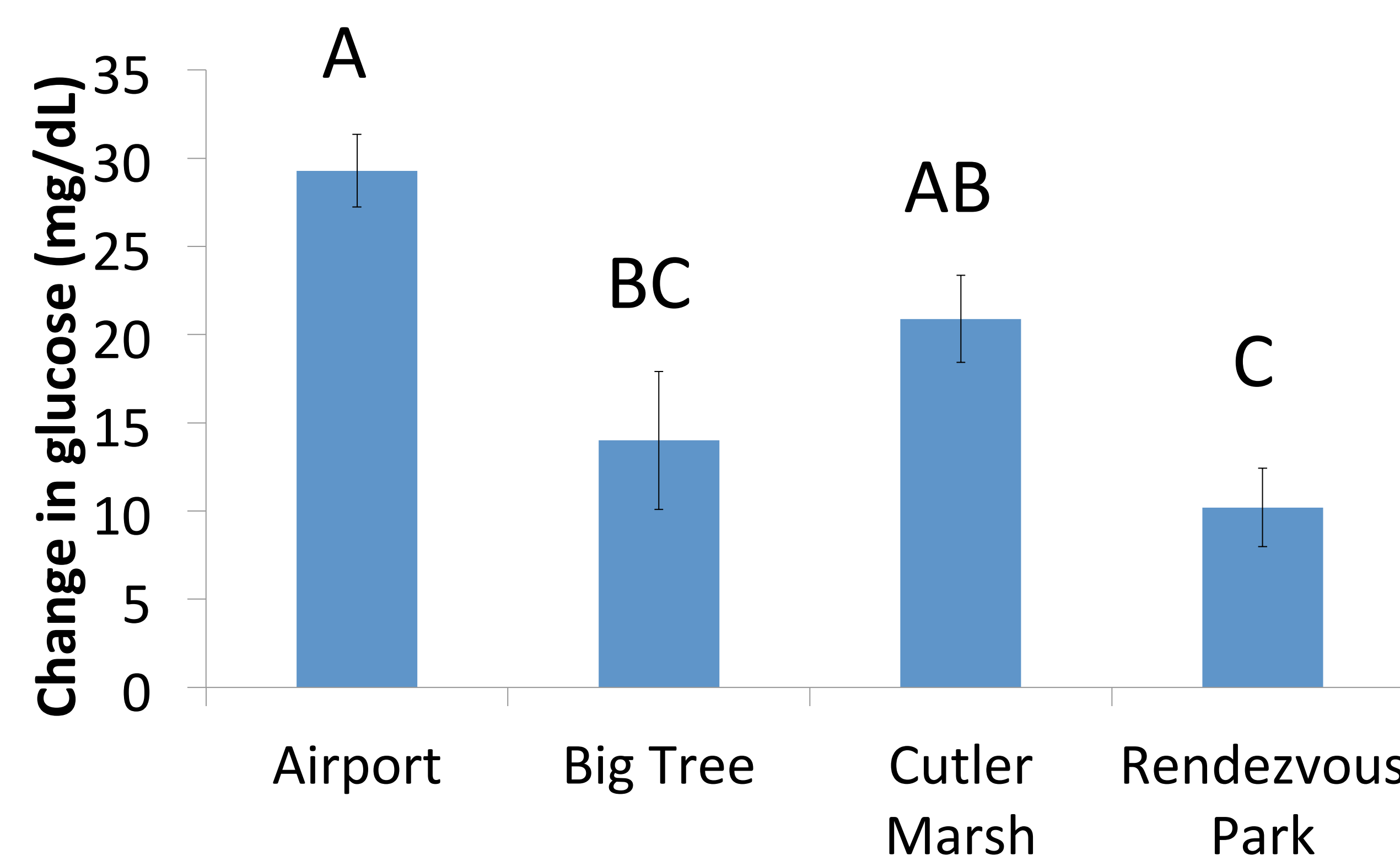


Figure 3. Difference between baseline and stress-induced levels of glucose in gartersnakes at four sites in Cache Valley. Letters not connected are significantly different ($p < 0.05$).

Results

- Baseline glucose levels are on average statistically lower in fall compared spring baseline levels ($t = 2.03$, $p = 0.04$), but stress levels did not differ ($t = 1.39$, $p = 0.17$; Figure 1).
- There were no differences between species in baseline glucose levels ($p = 0.7$), but *T. sirtalis* may have slightly elevated stress-induced levels ($p = 0.05$).
- There were no differences between sites at baseline during spring ($F_{(3,37)} = 0.06$, $p = 0.06$), but there were differences between sites at stress-induced levels ($F_{(3,34)} = 7.73$, $p < 0.001$; Figure 2) and the difference between stress induced-baseline levels $F_{(3,33)} = 5.32$, $p = 0.004$; Figure 3).
- There were no differences between sites in the fall ($p > 0.05$).

Conclusion & Future Analysis

- All populations do respond to stress by increasing glucose concentrations and a blood glucose meter can measure stress response.
- There are differences in stress responses based on the environment in which the snake lives.
- Blood glucose meters can demonstrate how much energy is available for use in a snake.
- This cheap field assessment will be valuable for determining snake stress response.
- In the future, we will measure corticosterone levels and compare them to blood glucose levels.

Acknowledgements

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