



Background

Where are histamine receptors located in a cockroach?

- Ocellar (1)
 - Histamine is a neurotransmitter of reticular axons
 - Histamine elicits inhibitory responses

Are there histamine receptors located in the leg?

- Currently unknown

What is a common antihistamine drug?

- Diphenhydramine
 - Acts on H1 receptor
 - also known as Benadryl
 - Used to treat allergies (2)
 - Known to cause drowsiness



Hypothesis

The presence of antihistamines will decrease sensory neuron firing rate in the limb of the cockroach.

Methods

- Anesthetize the cockroach
- Remove the lower left limb
- The 3 electrodes from the SpikerBox were placed into the leg as shown in Figure 1
- A slight tap on one of the barbs was applied to check for a response in the SpikerBox software
 - When a response is observed, the recording begins
- Apply constant physical stimulus
- The stimulus was removed when recording returns to baseline sensory neuron firing (RMS)
- After 30 sec from returning to baseline recording, apply 1 drop of the desired concentration of diphenhydramine
- After waiting for 30 seconds to allow for the drug to diffuse into the nerve, another constant physical stimulus was applied
- RMS was recorded until it dropped below the original baseline, and then an additional 30 seconds was recorded
 - Control: Saline
 - Diphenhydramine: 1M, 500mM and 250mM



Figure 1. Electrode placement on the cockroach leg

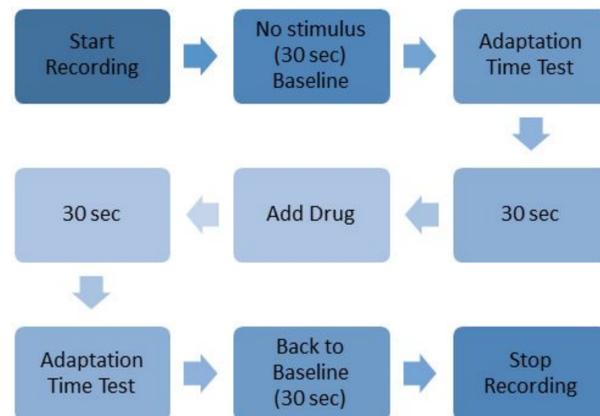


Figure 2. Flowchart of recording on when adaptation time test and application of drug occurred.

Results

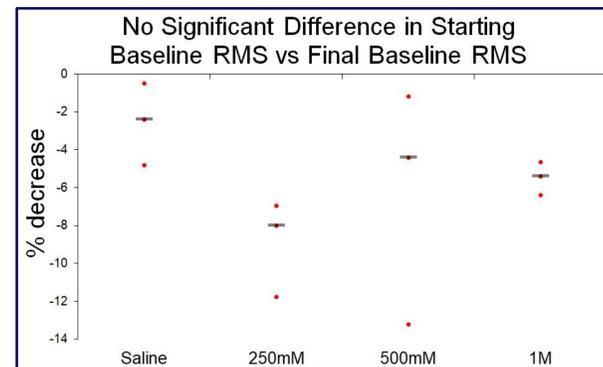


Figure 3. One-way ANOVA, p-value = 0.261, n = 3 for each condition

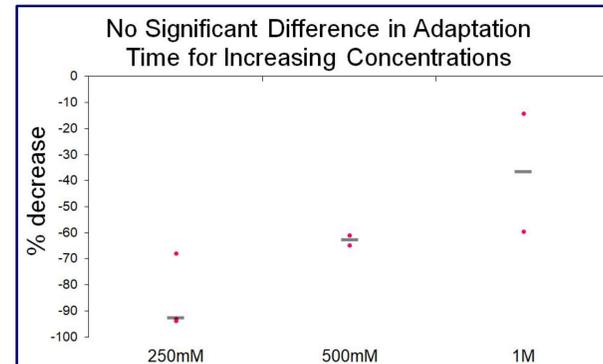


Figure 4. One-way ANOVA, p-value = 0.376, n=2-3 for each condition

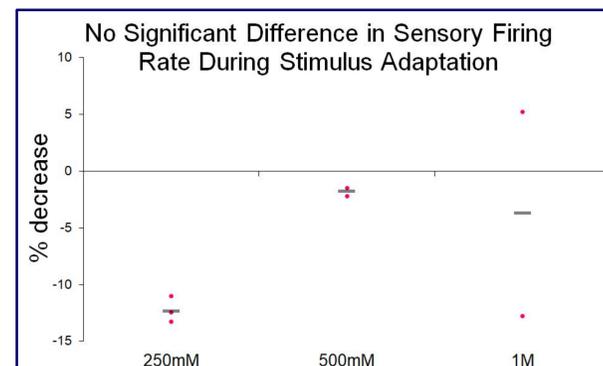


Figure 5. One-way ANOVA, p-value = 0.289, n=2-3 for each condition

Conclusions

- The sensory neuron firing baseline between the beginning and end of recording, showed a greater % change in all diphenhydramine groups compared to saline group (Figure 3)
- Diphenhydramine will cause adaptation to occur more rapidly
 - Trend: As diphenhydramine concentration increase, percent change in adaptation time decreases (Figure 4)
- Although there was no significant data, trends indicate that there may be histamine receptors present in the leg

Future Directions

- For future experiments, we should aim to increase our sample size to provide a more sufficient range of data points.
- In addition, we could repeat the experiment with a second generation antihistamine such as Loratadine to observe if a similar effect happens.

Acknowledgments

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Key References

1. Lin, J., & Wu, C. (1996). Characteristics of Histamine Receptors on the Ocellar L-Neurons of American Cockroach *Periplaneta americana*. *Journal of Insect Physiology*, 42(9), 843-849.
2. Sicari, V., & Zabbo, C. P. (2019, February 23). Diphenhydramine. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/30252266>