

The Study of Alpha-Gal Syndrome: A Survey to Determine the Duration of Tick Bite and Removal Methods Used

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Introduction

Alpha-Gal Syndrome is a disease that is caused by the Lone Star tick bite. It can cause allergies to red meat and mammal products, but little is known about the transmission of the disease from the tick to the human.¹ The disaccharide galactose-alpha-1,3-galactose is carried in the saliva of the Lone Star tick and when the tick bites someone the disaccharide sugar can sometimes enter the host's bloodstream.² This disaccharide causes Alpha-Gal Syndrome and is also found in red meat and mammal products which is why when someone who is infected eats red meat or mammal products their body receives an immune response.³ There are many possible prognoses when it comes to Alpha-Gal Syndrome in that it can be lifelong or that it can be outgrown.² It can vary in duration of disease, and the presence of alpha-gal is increasing in the United States.

The purpose of this study is to determine if the duration of a Lone Star tick bite and/ or the removal method used affects the probability of the affected person being infected with Alpha-Gal Syndrome. Since there is so little research there are many factors to be considered including the duration of the tick on the skin of the host, the type of method the host used to remove the tick from their skin, if the tick has any control over the expression of the Alpha-Gal sugar or if there are other mechanisms at play, and many more. There is much research to be done about the difference in the timelines between those who stay allergic and those who become nonallergic in the future and the timing and methods used when a tick bite takes place.

Objectives & Hypotheses

Objectives:

- To develop and launch a survey nationwide that will help us to further our understanding of the transmission and selection of Alpha-Gal Syndrome.
- To know more about the mechanisms that Alpha-Gal syndrome uses to infect hosts and how to give the communities more awareness about Alpha-Gal syndrome.
- Receive Institutional Review Board (IRB) approval to administer the survey and collaborate with community partners, Association with Public Health Labs, Teton Weed and Pest, and Wyoming State Vet Lab, to distribute the survey throughout the country.

Hypotheses:

- H1: If the duration of a tick bite by a Lone Star tick was known, then the probability of a host displaying Alpha-Gal syndrome goes up with the amount of time the tick stays on the skin.
- H2: If the way the Lone Star tick is removed in a way that does not cause the tick pain, or decapitate it, then the likelihood of infection by Alpha-Gal syndrome will be reduced.

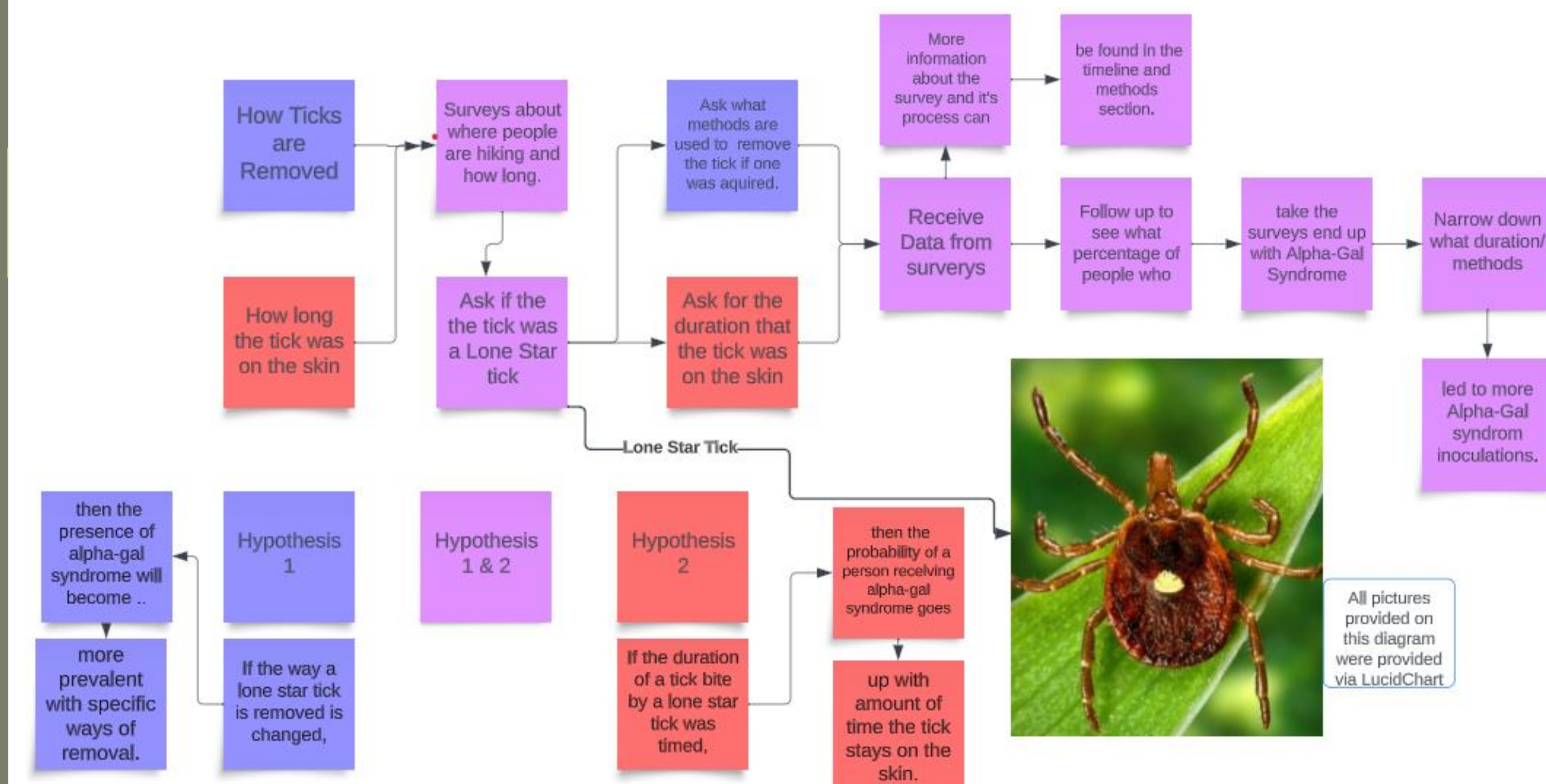


Figure 1: This image represents the two hypotheses that have been represented during this study. The blue boxes represent hypothesis one and the red boxes represent hypothesis two. The purple boxes show where the two hypotheses overlap during the study.

Methods

CITI Human Subjects Training (Surveys are considered human trials.)

- The human Subjects Training took about 2-3 hours

Design a survey that allows for the proper conducting of research

- The designing of the survey took about 2-3 days and was edited by the Capstone class and others outside of the class. It was a bit tough to produce the questions for the survey and make sure that they were worded correctly.

Submit an IRB exemption request so that the survey may be used to conduct human trials.

- Completing the IRB exemption was the most difficult part of this process because multiple things were required such as specific language.

While waiting on a response from the IRB the survey is uploaded into Qualtrics.

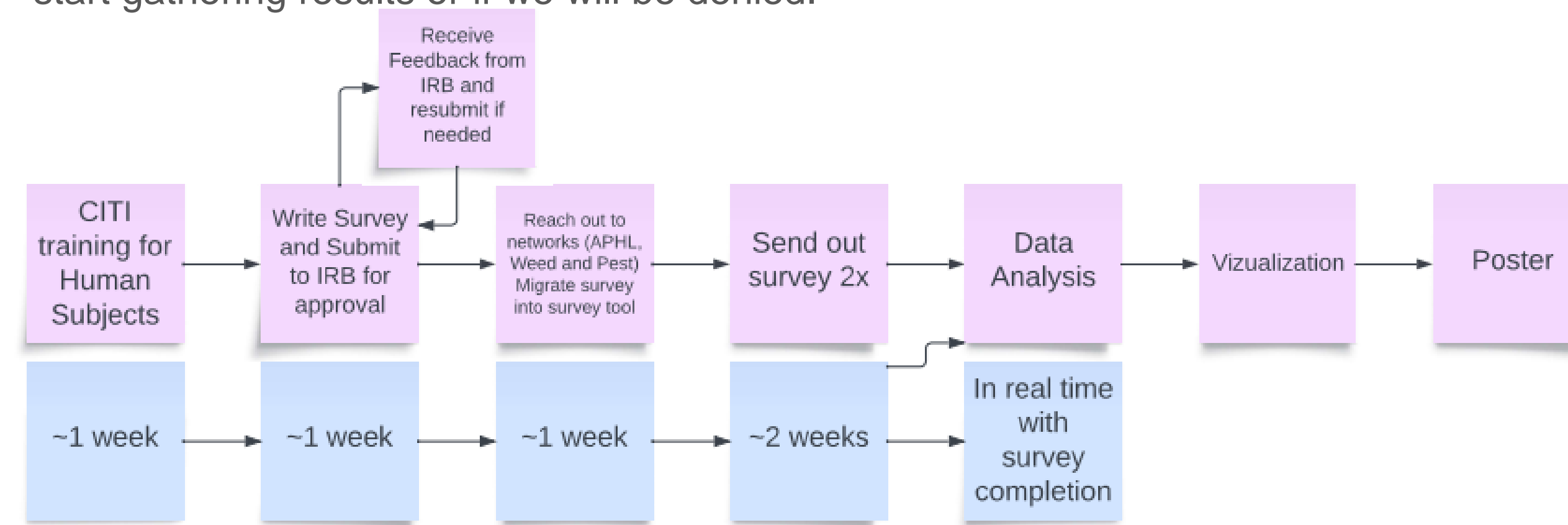
- Navigating Qualtrics was also tough, trying to figure out how to make the questions clear and easy to answer/understand to get clean results.

Once a response is received, we then had to implement the feedback given by the IRB.

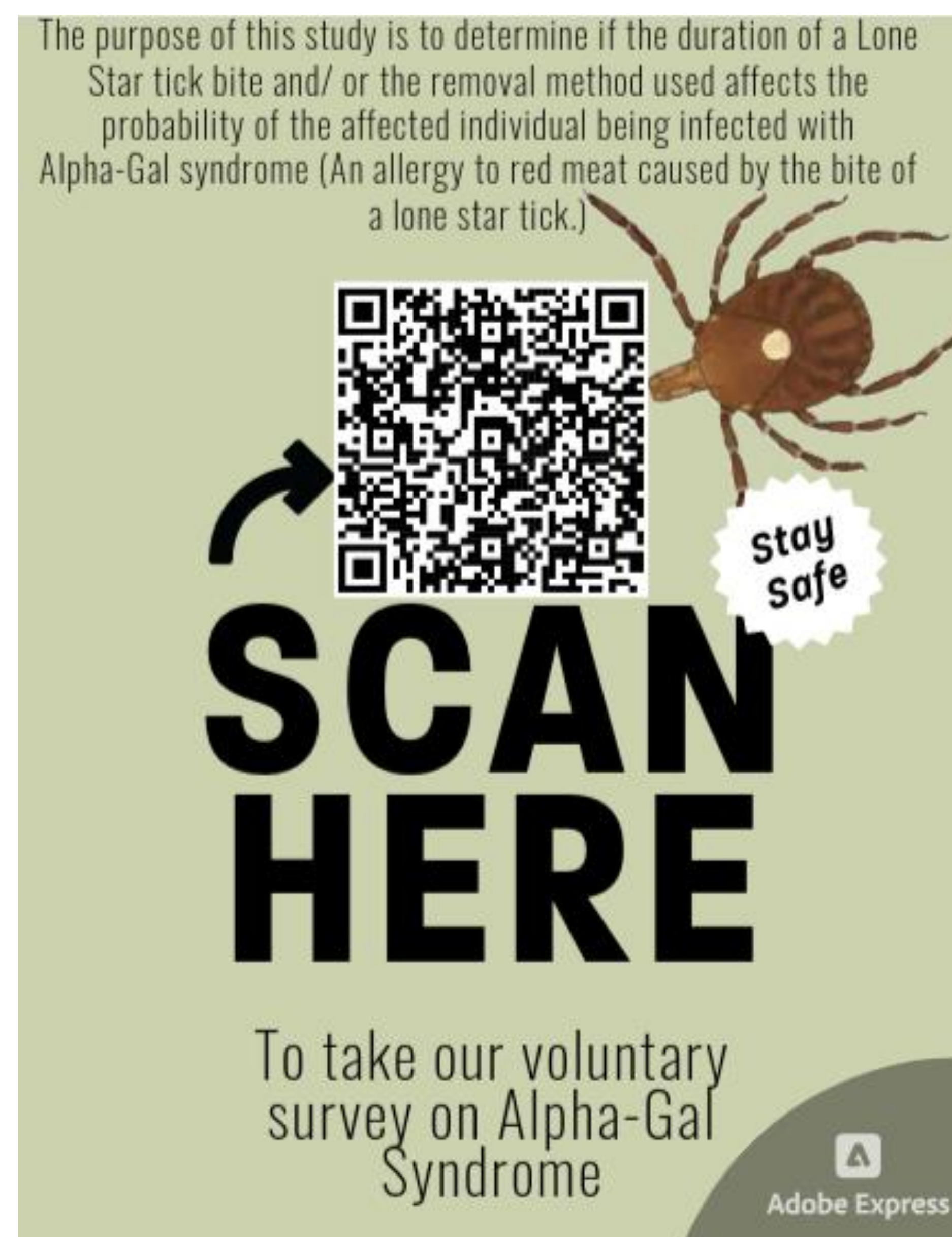
- There was about a week and a half wait for the response to the initial IRB exemption turn-in. We then had to make a flyer so that everyone could easily access the survey with a QR code and make the necessary changes that the IRB required.

Waiting for the response from the IRB to see if the experiment will be approved or not.

- We are still currently waiting on the second response to the second turn-in of the IRB exemption. This will hopefully tell us whether we are approved to send out the survey to start gathering results or if we will be denied.



Results



Discussion

The process through which becoming certified and able to run this experiment has been a very knowledgeable experience. Learning the process of becoming human subjects certified and IRB-approved has been very interesting and tougher than was expected. This experiment is still ongoing and pending IRB approval, results will be obtained. The questions that the survey contains were carefully thought out to try not to give much personal information. They were also edited by Rachel Watson, Caitlin Lawrence, and the capstone class, which was very beneficial when it came to making sure that the questions were worded correctly and were understandable by all people no matter their scientific background.

The IRB exemption took quite a bit of time and Rachel Watson helped to make sure that all the sections were filled out properly and were worded correctly so that it was not immediately denied due to lack of proper wording or information. The IRB, at this point, has given a couple of things that needed to be added or edited, and those were completed and turned back into the IRB so that they can take another look at it and either approve or deny the exemption. If they do approve the exemption then the study will continue, and the survey will be sent out across America through our community partners. If they do not approve the exemption then the study will not proceed, but this will have been a wonderful experience, and knowing how to perform my own experiment and be able to get everything up and running is more knowledge than any other class in college has provided.

Conclusions & Future

Though this experiment is still ongoing, and no results have been obtained the knowledge about the setup and work to get to the beginning of the experiment has been greatly accepted. Specifically, the knowledge of how to go through human subjects training and knowing what experiments qualify for specific exemptions rather than going through the full Institutional Review Board process. This experiment qualified for the IRB because it causes minimal harm to humans and does

For future testing furthering the specifications of the experiment to specific body parts and time durations and in a more environmentally stable environment would be the best. Also, the use of human blood and Alpha-Gal sugar to combine them and see how they react would be a good way to learn on a molecular basis how Alpha-Gal sugar interacts with the blood of humans without endangering human life or using animal subjects. If animal subjects are something that can be used, then the use of the animal to test specific time durations and bite locations. This would have to exclude animals that naturally carry the Alpha-Gal sugar, such as pigs, cows, and sheep. Interestingly, there is talk of a vaccine that would help to ensure that further tick bites would not prolong the disease, which points research in the correct direction.⁴

The future of this experiment depends on the ruling of the IRB and whether the study is provided the exemption or not. As discussed above if the IRB does approve the exemption, then the study will continue and will be able to be sent out across America. If the exemption is denied then the study will not continue past the creation of the survey and will not be able to obtain results from this study, but the knowledge that this process has provided is more than was ever expected.

Acknowledgments

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- Teton County Weed and Pest District
- Caitlin Lawrence
- Association with Public Health Labs
- Institutional Review Board
- Nicole Person

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