Imbibing Water in Questing Ticks

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Abstract

Although some ticks are known to stick to a host for the entirety of their life, some are known to drop off of their host after feeding to take time to molt. Of those who drop off of their host, some have been observed to drink water. However, it is unknown whether all species of tick drink water, and if they do, in the same way as each other. Our goal was to look into which species drink water, their drinking patterns, and how they might be drinking differently from each other. Our results showed that ticks appear to continue drinking as a semi-steady pace up to one hour as long as water is available for them to drink. Minimal differences were traceable through the experiment performed. Our research could lead to better understanding of a tick's natural behavioral patterns and further add to our knowledge of their biology, which can add to information that could pertain to their being a vector species.

Purpose

The purpose of this research is to determine whether various species of ticks drink water, and how much each species drinks on average, as well as to compare results to look for varying patterns of drinking between varying species.

Questions, Hypotheses, and Predictions

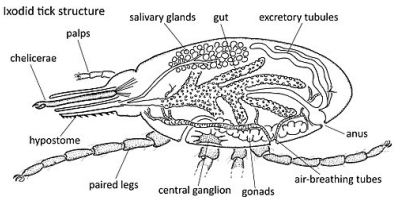
Question: Which species of tick drink water? How much do the ticks drink?

Hypothesis: Species-specific patterns of water drinking may occur.

Prediction: Either one species will drink more with a different pattern.

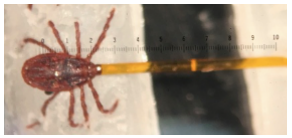
Study System

Two species, *Rhipicephalus sanguineus (brown dog tick)* and *Dermacentor variabilis (American dog tick),* commonly found in the mid-central states of US, were used for the study. Their organ systems are almost identical in terms of positioning due to both being of the *Ioxidae* Family.



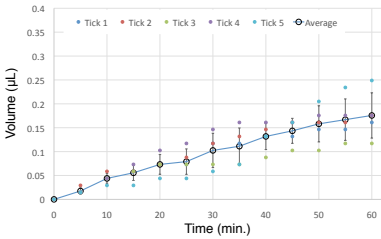
Methods and Experimental Design

Five female ticks of each species were tested. With each of the five ticks, we mounted them in wax to immobilize, and placed a capillary tube (~470 nm internal diameter) around their mouth parts to induce feeding, and filled the tube with water. A control tube without tick was used as the control for compensating evaporation of water. The amounts of water each tick drank were monitored in every five minutes for an hour. Statistics of the results were analyzed in Microsoft excel.

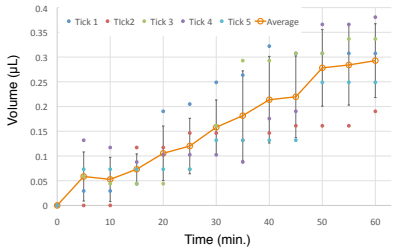


Results

Both species, *R. sanguineus* and *D. variabilis* , imbibed water 0.29 µL and 0.17 µL in the averages, respectibvely. The rates of drinking remained semi-steady, almost linear. However, *D. variabilis* on average drank more than *R. sanguineus*, despite individuals overlapping



R. sanguineus



D. variabilis

Conclusions

Based upon the time lapse we had for the ticks, covering about an hour, it appears that ticks will continue drinking as long as water is present and they are not attached to a host, seeing as their drinking stayed relatively steady. The drinking patterns of ticks appear to have more of a linear trend on average, and make it appear that they would have no issues drinking for much longer than the one hour we tested. However, both species of tick drank at equally steady rates, so it does appear to be consistent among species.

Future Directions

With the results from their intake of water, it would be interesting to look at where the water is being stored and used within the tick, as well as the effects of drinking water in comparison to what happens while drinking blood. Through dissections and given enough time, we could most likely observe the physical and chemical impact of drinking water compared to that of living off of blood as they typically prefer.

References

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