Social Behavior as a Predictor of Immunity in Pine Sawflies

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INTRO:

Pine sawfly species demonstrate measurable variation in social behavior. When isolated, individuals of gregarious species will stop feeding and search out other individuals, suggesting they experience stress when isolated. This study aims to determine if social behavior is related to immune system response. Specifically, does small group size have a larger effect on the immune response of social species compared to solitary species?



D. similis Low sociability







N. lecontei High sociability

METHODS:

Three different species (D. similis, N. virginianus, and N. lecontei) that vary in sociability were reared in the lab. During the larval stage families from each species were split into treatment groups small(n=3), medium(n=12), or large(n=25). Individuals were exposed to treatment groups for one week before immune response was measured.

Sociability	Species	Group 3 (n)	Group 12 (n)	Group 25 (n)
High	N. lecontei	7	9	7
Medium	N. virginianus	5	4	6
Low	D. similis	12	10	12

When exposed to viruses and parasites, these species will encapsulate the invasion by coating it with melanin. More melanin coating corresponds with greater immune response. We therefore measured immune response by inserting an implant into the body cavity of the larva to mimic a parasite invasion. After one day the implant was removed and measured by taking images with a microscope and determining the area covered with melanin.



Larva and 0.5cm fishing line

Implant inserted parallel to the body cavity

Implant coated in melanin

Species' social behavior predicts immune response in pine sawflies, but treatment group size does not.



There is a significant difference between the immune response of the solitary and the moderately social species (F= 3.65, p= .03*). The solitary species may have a higher overall immune response because it is not as closely related to the other two social species by phylogeny.





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Histogram representing the distribution of each species immune response. The moderately social species (*N. virginianus*) generally had a weak immune response.



Analysis of the interaction between species and group size indicated no significant results. Trends imply that both social species were affected by treatment group size while the isolated species was indifferent. Surprisingly the most social species did not exhibit a decrease in immune response when exposed to small group size.

DISCUSSION:

The moderately social species had the most variation in immune response when exposed to different group sizes. From an evolutionary perspective this could be due to their ability to adapt to both small and large group sizes in their natural environment.



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