

I Got it from Mama: Exploring trans-generational effects of maternal infection on offspring fitness

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Background

Individuals experience many challenges in their lives which can impact offspring through non-genetic inheritance.

Short bacterial infections can result in offspring that have stronger immune systems than those from healthy mothers.

Trans-generational effects of a long-term parasitic infection on offspring have not been studied.

Experimental Design



Gryllus firmus
sand field cricket

Healthy female cricket
(Control)

Parasitized female cricket
(Experimental)

Infect females with parasite in early penultimate instar



Cricket infected with the horsehair worm
Paragordius varius

Mate sexually mature adult females to a male

Allow females to lay eggs for 7 days, replacing egg cup after first 2 days

1st egg cup:
Incubate & hatch offspring

2nd egg cup:
Count total eggs laid

At end of egg-laying, females massed & dissected to verify infection status & mating status, and to record ovarian mass

Eggs allowed to hatch for 7 days after first hatchlings emerge & then eggs counted to determine % hatching success

3 days after hatching, 10 hatchlings measured for average hatchling length

Raised male & female offspring to adulthood to investigate growth, immunity & reproduction

Growth

- Mass
- Pronotum Length

Immunity

- LD₅₀ host resistance
- Melanization of filament

Reproduction

- Male sperm viability
- Female ovarian mass

Research Objectives

Question 1 - Does a prolonged parasitic infection negatively affect a female cricket's ability to reproduce?

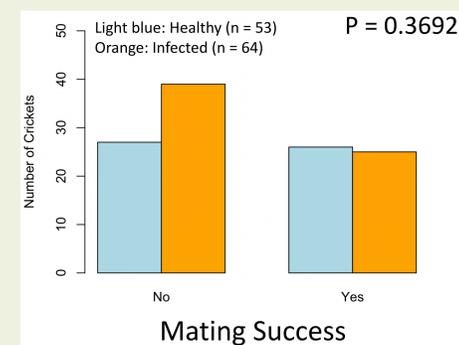
- Parasitized females may have lower mating success, oviposition, & fewer eggs.
- Parasitized females may also produce fewer, but higher-quality offspring.

Question 2 - Does prolonged maternal infection have trans-generational effects on offspring growth, immunity, and reproduction?

- Offspring from parasitized mothers may upregulate their immune response to have a higher survival from a bacterial infection or greater melanization abilities.
- Offspring from parasitized mothers may suffer long-term consequences to their growth and reproduction if increased immunocompetence comes at a cost, so they may be smaller and have lower sperm viability or ovarian mass.

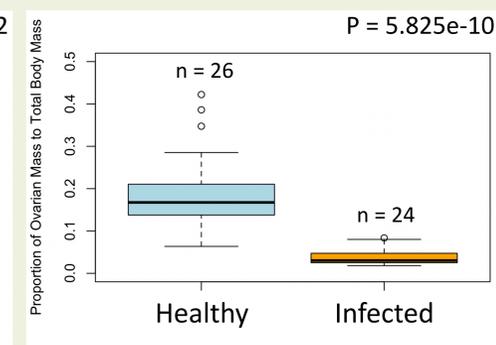
Results

Mating Success of Mothers



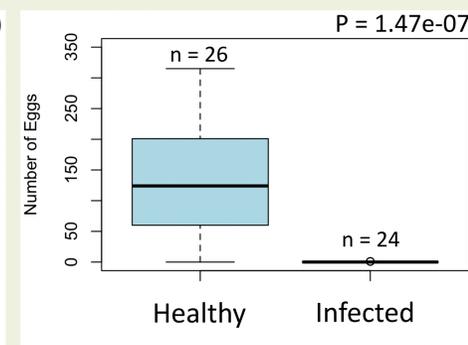
We found no significant association between infection status and mating success in female crickets (X-squared = 0.8063; df = 1).

Average Proportion of Ovarian Mass to Total Body Mass of Mated Females



We found a significant difference between the mean proportion of ovarian mass to total body mass for healthy and infected mothers (mean of healthy = 0.1927; mean of infected = 0.03840; t = 8.974; df = 27.51).

Average Number of Eggs Laid



We found a significant difference between the mean number of eggs laid for healthy and infected female crickets (mean of healthy = 137.2; mean of infected = 0.1250; t = 6.924; df = 25.00).

Acknowledgements

2021 Dr. and Mrs. Randolph Ferlic Summer Undergraduate Research Fellowship