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AMP Expression in Energetic Hybrid *D. melanogaster* Infected With *P. rettgeri*

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AMP Expression in Energetic Hybrid *D. melanogaster* Infected With *P. rettgeri*

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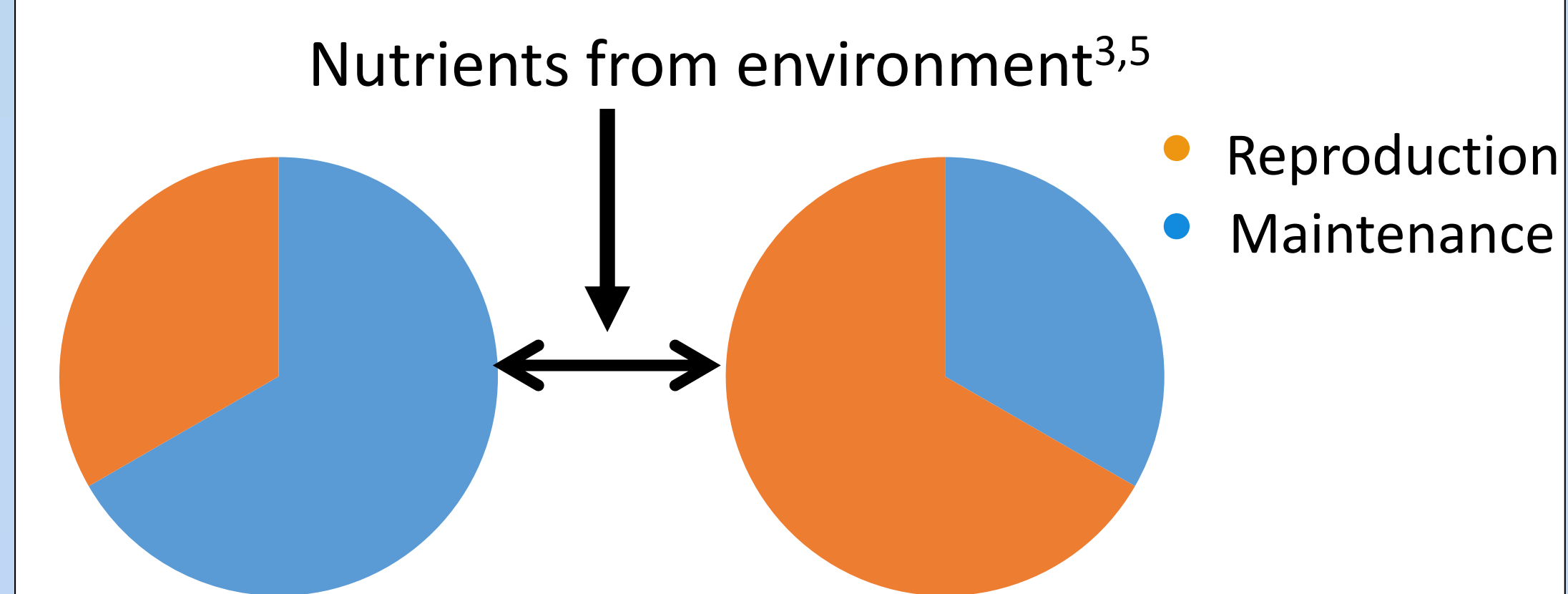


Abstract

The purpose of this experiment was to investigate immune function and energy metabolism, particularly the levels of antimicrobial peptides produced in *Drosophila* energetically compromised genotypes. This will provide the ability to investigate energetics of immunity without changing diet. Flies were infected with the bacteria *P. rettgeri* and the resulting immune response was investigated. Females did not mount as effective an immune response as males. All flies exhibited decreased survivorship from infection. Control flies survived at higher levels and showed no mitochondrial:nuclear interaction.

Introduction

Life-History Tradeoffs

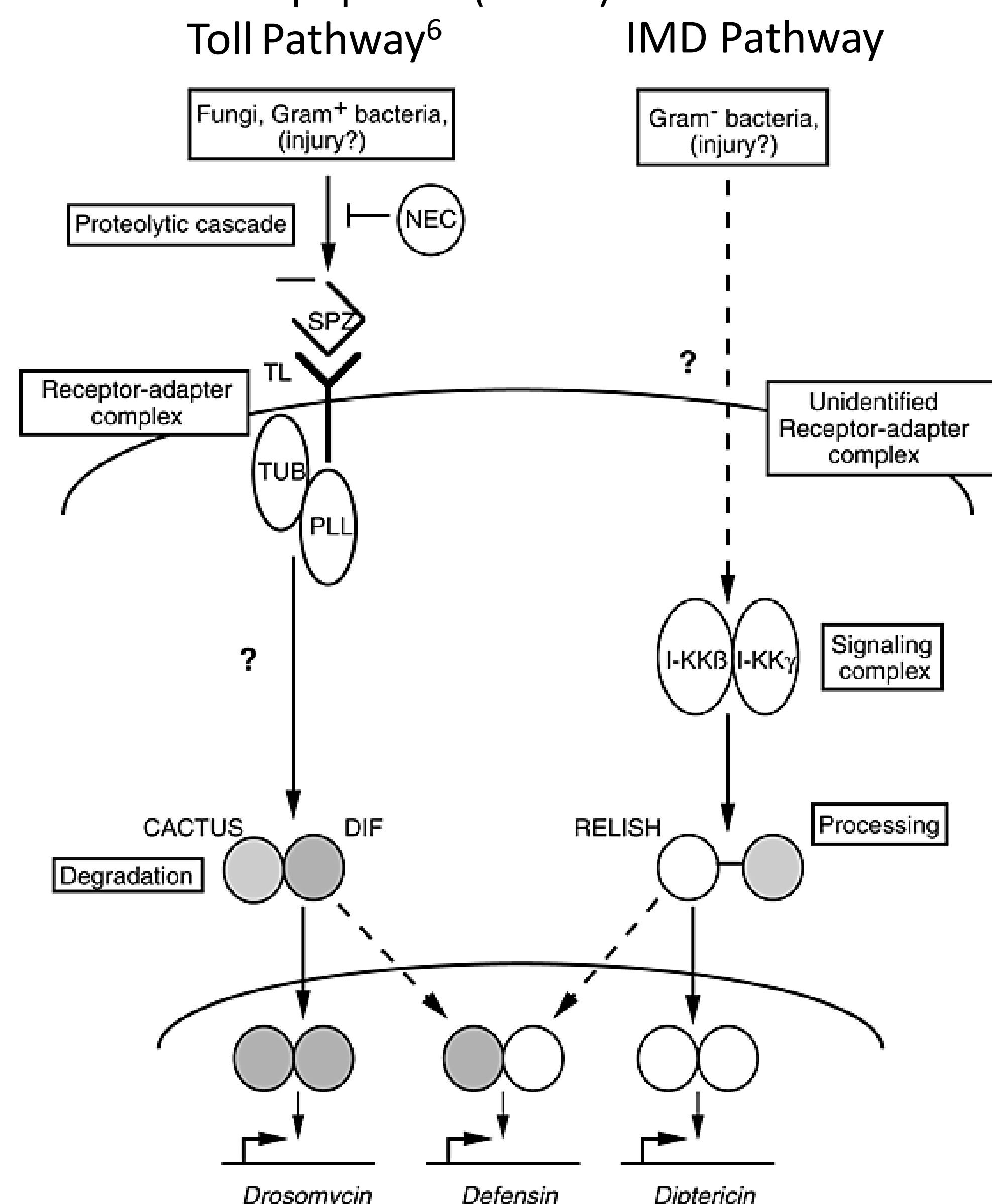


Providencia Rettgeri

- P. rettgeri*, a natural cause of infection for *Drosophila*, is a gram-negative bacteria that is pathogenic to fruit flies.
- The infection multiplies very quickly and causes moderate survival rates, found to be ranging from 40%-80%¹.
- Providencia* has been found in humans as part of natural gut bacteria as well as gastric upset⁷.

Innate Immunity

- While adaptive and innate immunity is present in animals, invertebrates, like *Drosophila*, only possess innate immunity as a defense against pathogens. This form of defense results in production of antimicrobial peptides (AMPs).



Genotypes

- The mitochondrial-nuclear incompatible genotype (*simw*⁵⁰¹);*OreR* decreases the fitness and fecundity of fly larvae.
- This is because the incompatibility causes incorrect synthesis of certain proteins necessary for development, which delays it².
- Five other genotypes were used in this experiment as compatible genotypic controls, with no interactive effect between their mitochondrial and nuclear genotypes, their oxidative phosphorylation functions normally.

Motivation

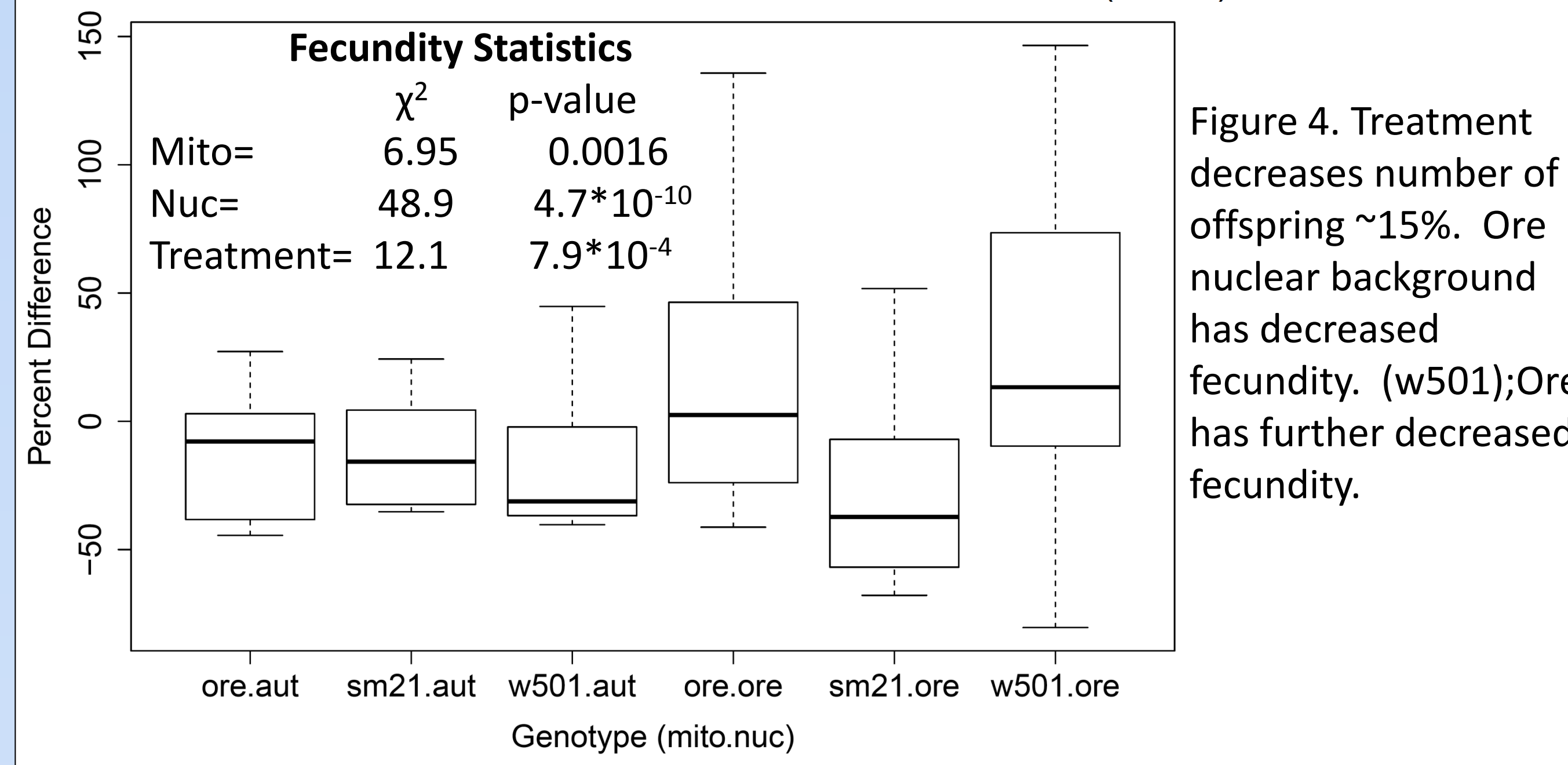
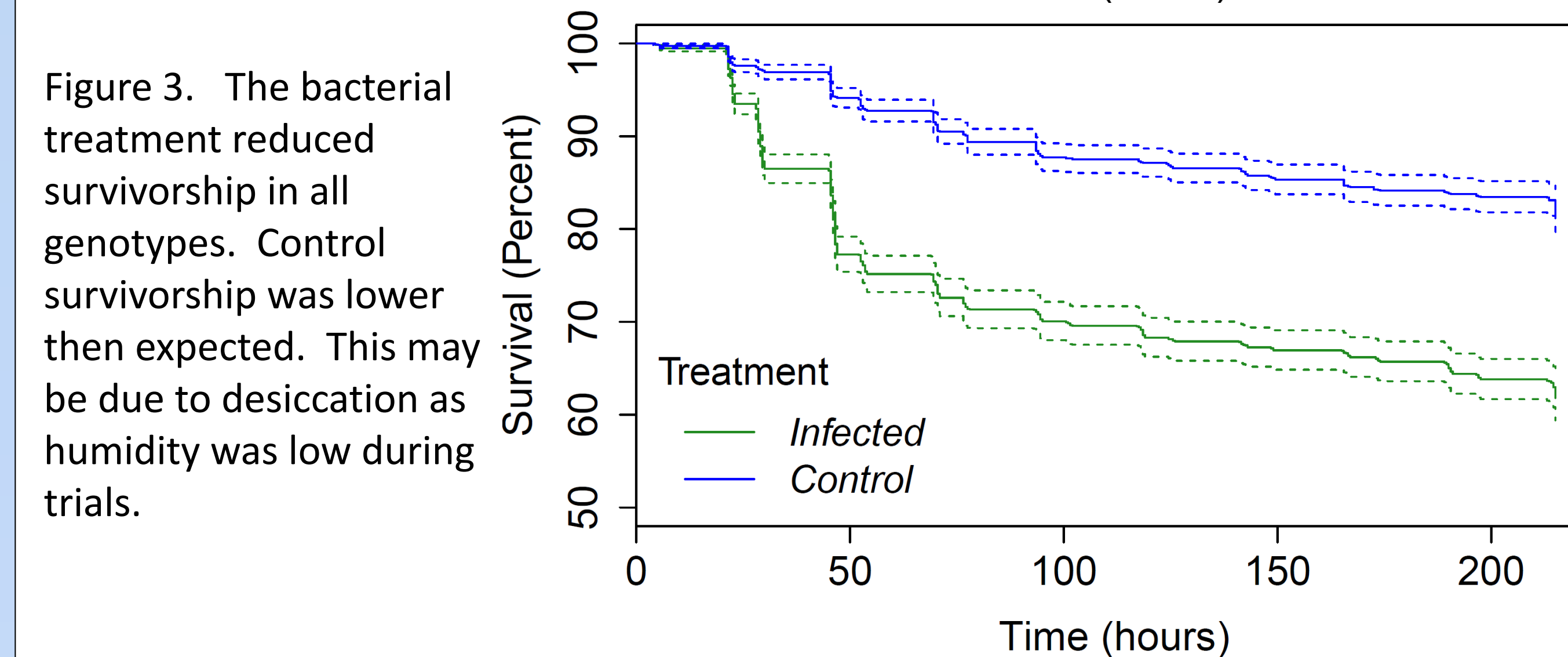
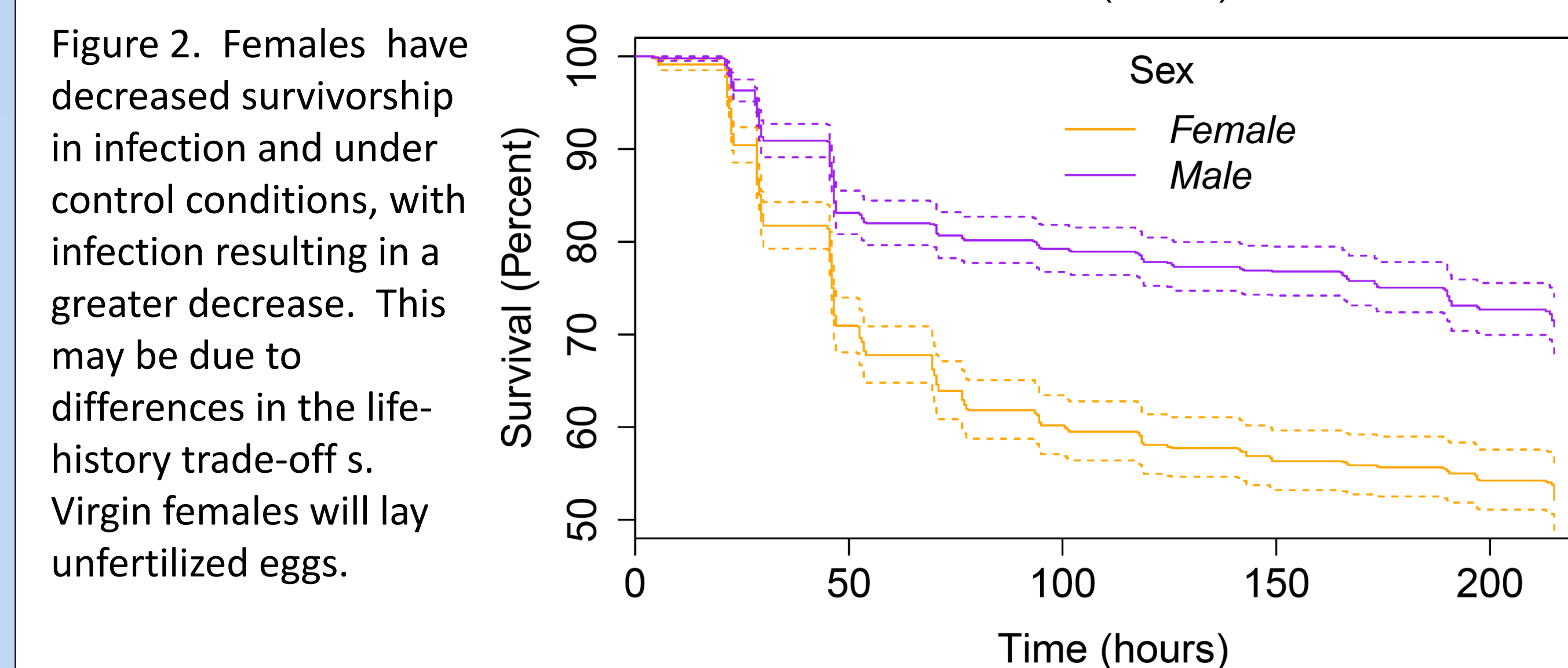
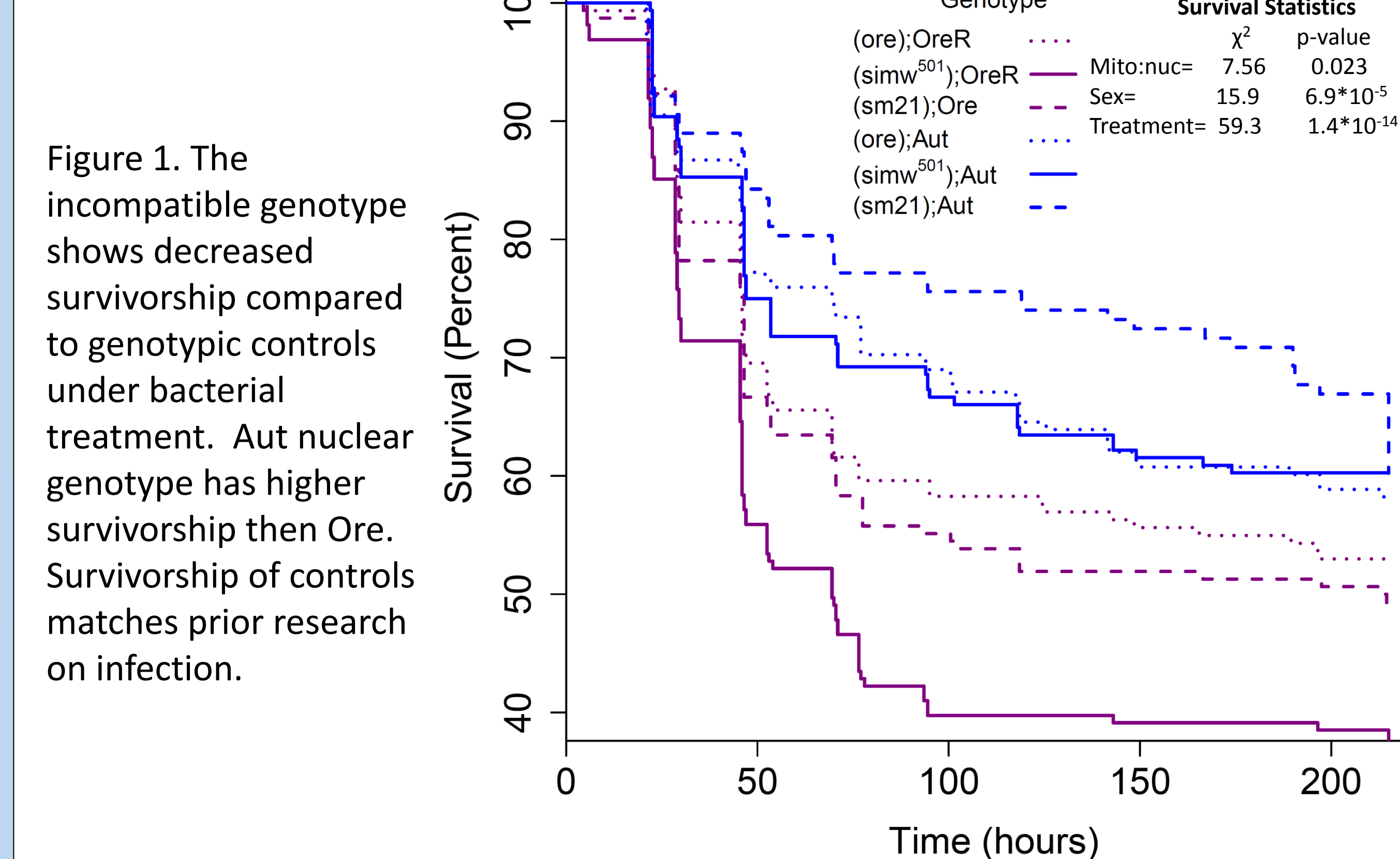
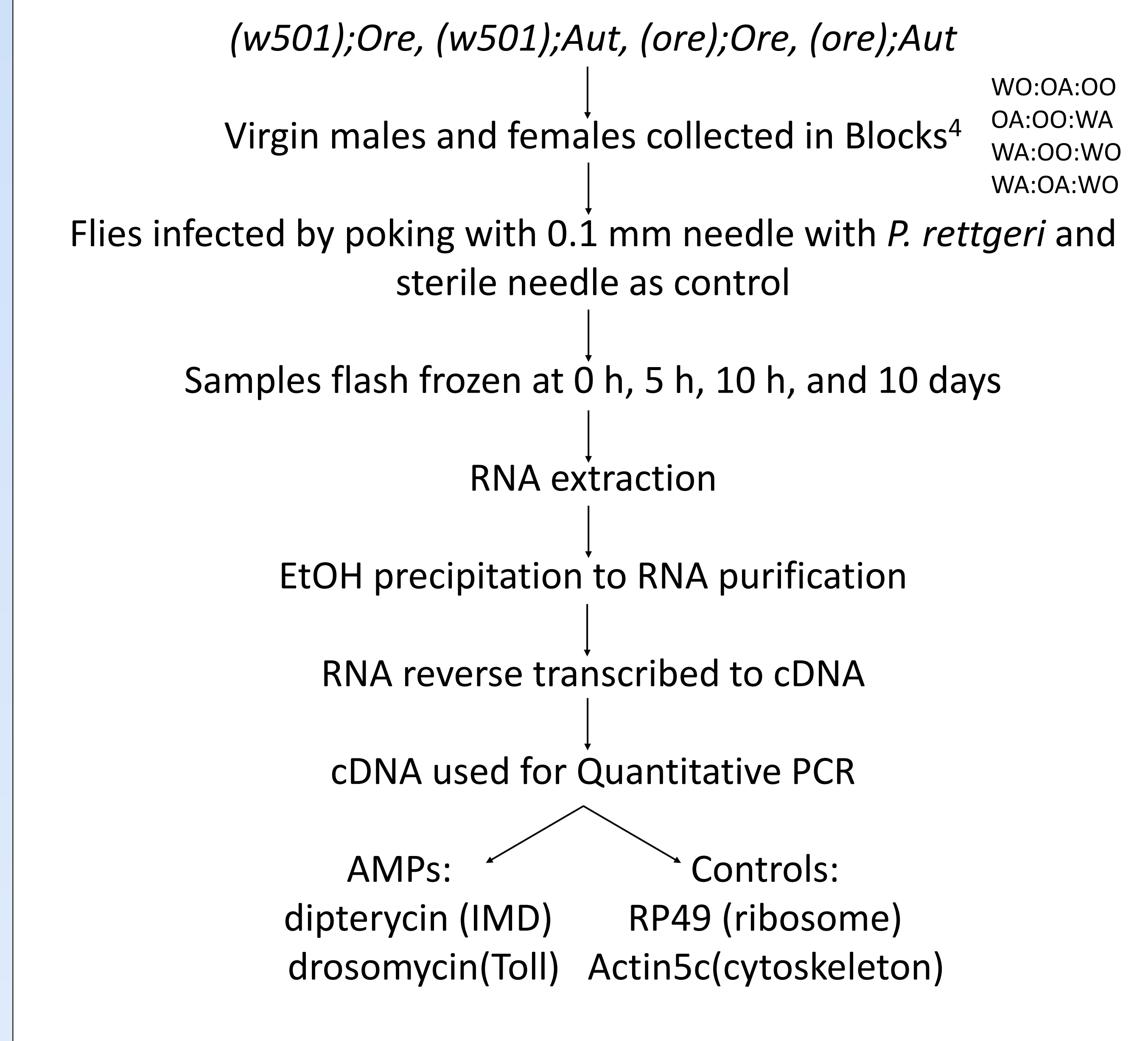


Figure 4. Treatment decreases number of offspring ~15%. Ore nuclear background has decreased fecundity. (w501);Ore has further decreased fecundity.

Methods and Materials

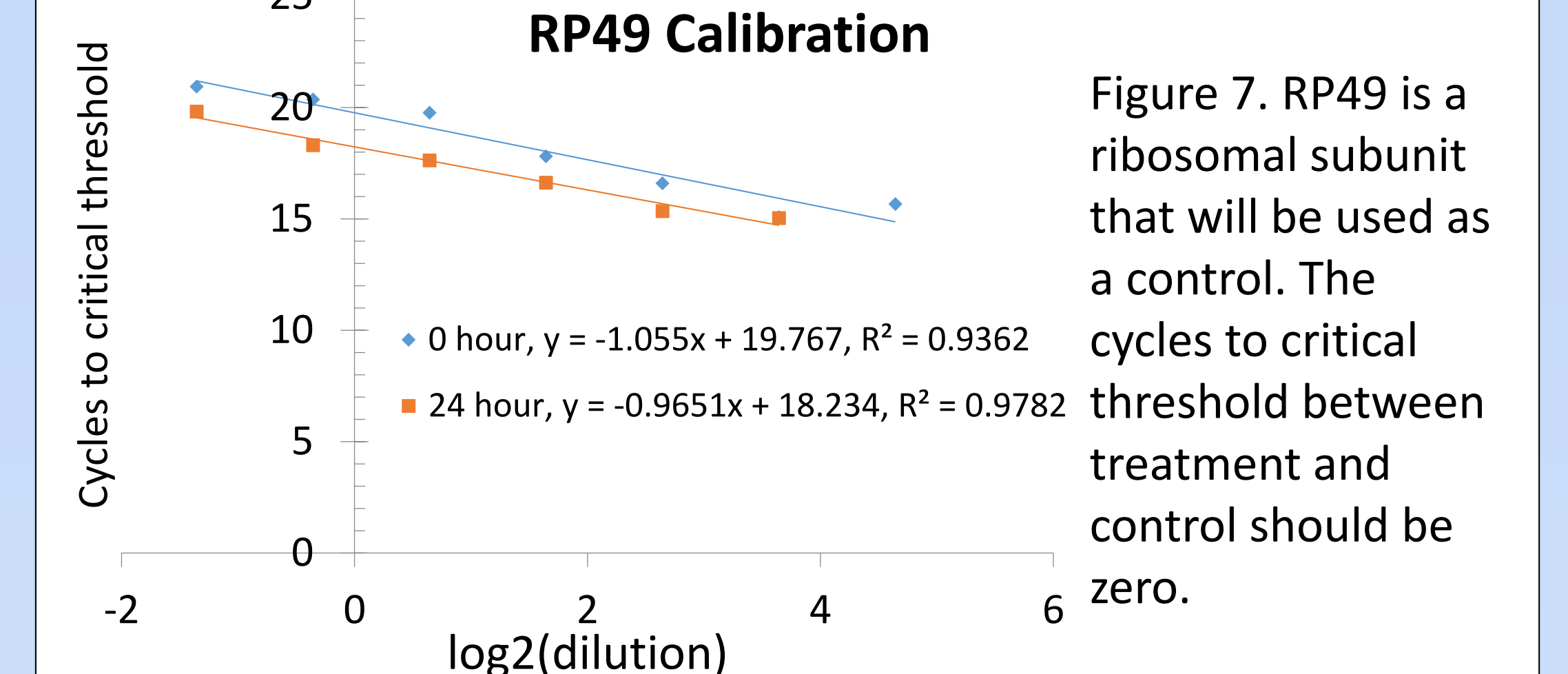
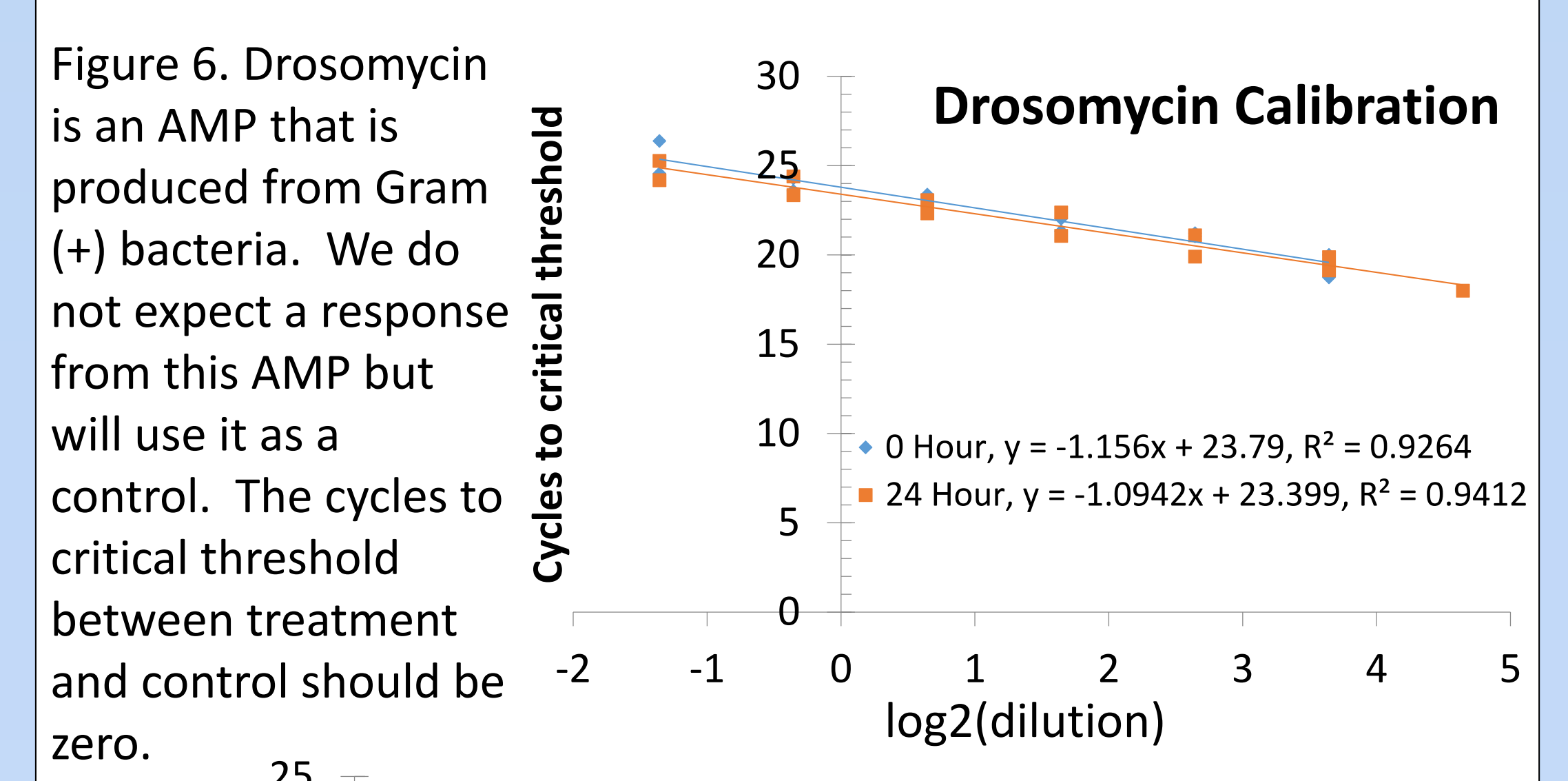
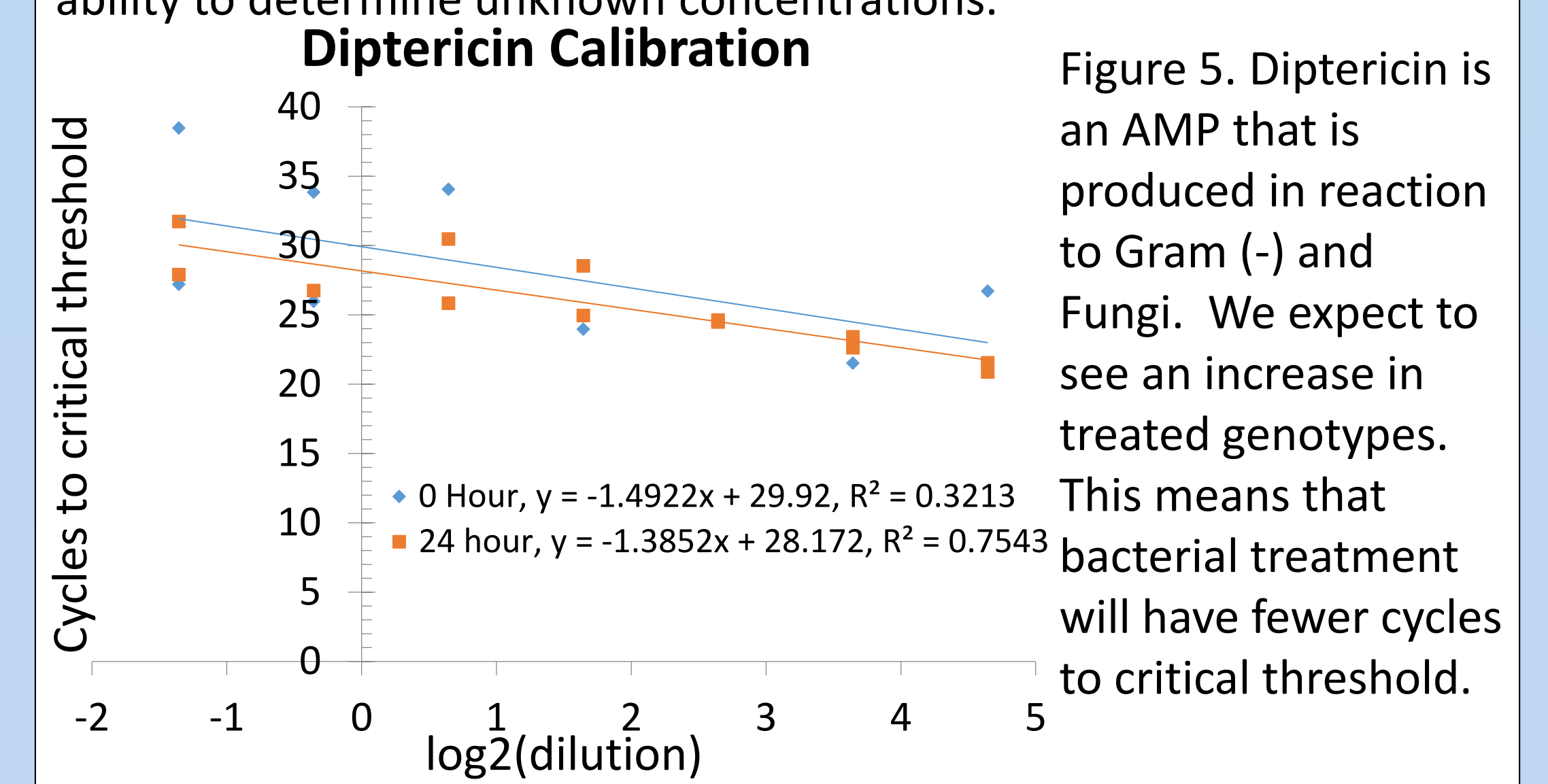


Predictions

- The mitochondrial-nuclear incompatible genotype (*simw*⁵⁰¹);*OreR* mount a less effective AMP response than the other genotypes due to its lower level of energy. This will correspond with lower immune activation and decreased survival.
- Genotypes mount similar immune responses, but the incompatible genotype will have lower survival due to energy limitations.

Results

The slopes in these plots are the efficiency of the qPCR and R² measure reproducibility between samples ideally, which should be one. A slope of one means that the efficiency of the primers predict the concentration. Slopes under or over one will result in decreased ability to determine unknown concentrations.



Continued Research

- Two of four treatment blocks have been collected and are in the stages of mRNA extraction and cDNA processing. qPCR primers will continue to be optimized by changing temperature of the reaction.
- Future experimentation on larvae will be done to investigate the differences in energy spent, since larvae don't need an energy allotment for reproduction, just for growth. Bacterial load in adults will also be performed to test effectiveness of pathogen clearance.

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Acknowledgements

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