Extrinsic and Intrinsic Factors Influencing Parasite Burden in the Big Brown Bat (Eptesicus fuscus)

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Introduction
➢ In most host-pathogen systems, the key feature of transmission dynamics and rate of spread of a parasite or disease is the variation among hosts in the numbers of parasites they harbor and the factors controlling infection
➢ Pathogens are typically aggregated across their host populations: relatively few individuals are heavily infected, while most potential hosts suffer light infections or remain uninfected
➢ Aggregation among hosts may be generated by variation among individuals in their exposure to parasite infective stages and by variation in susceptibility once an infectious agent has been encountered
➢ Host heterogeneity in parasite burden has a strong influence on the establishment and subsequent spread of pathogens
➢ Understanding the basis of this variation is critical to understanding transmission dynamics and the development of effective mitigation strategies

Objective
➢ To determine the relative influence of various intrinsic and extrinsic factors on parasite burden in E. fuscus
➢ Model: Big brown bat, Eptesicus fuscus and its intestinal helminths
➢ Intrinsic factors: Sex, age, body condition, immunocompetence
➢ Extrinsic factor: Colony of origin

Methods
Bat captures
➢ Six colonies in SW Michigan and N Indiana (USA) sampled June-August, 2008
➢ Captured 47 females and 32 males, including 48 adults and 31 juveniles
➢ Sex, age, mass, forearm length recorded
➢ Body condition calculated as (forearm length / mass) x 100

Functional immunocompetence
➢ Bacterial killing assays (BKA) performed with Staphylococcus aureus and Escherichia coli
➢ Hemolysis/Hemagglutination assays performed with rabbit red blood cells assess relative activity of complement, native antibodies (NAbs)

Helminth burden
➢ Intestinal parasites collected, counted, stained, and identified
➢ Data analyzed via structural equation modeling

Introduction

1. Trematodes were dominant form of parasite encountered

2. Parasite aggregation among hosts in sample population

3. Model of host susceptibility

Future Research
➢ Expand sampling spatially to include additional colonies in other regions to examine patterns of local adaptation
➢ Examine year-to-year variation in parasite burdens and the factors predicting host susceptibility
➢ Include additional factors in our model that may influence parasite burden, such as neutral and immunogenetic diversity, hormone levels, measures of stress, and different components of immune function
➢ Test our model with experimental infections

Conclusions
1. Parasitism was female-biased
➢ Not a result of inter-sexual differences in immunocompetence
➢ Higher activity of females may lead to increased exposure to intermediate hosts
➢ Females had better body condition, and may promoted higher parasite survival

2. Individual variation in immune response was critical for predicting infection risk
➢ Individuals with low lytic activity are most heavily parasitized
➢ These individuals may drive transmission of helminths to intermediate hosts and promote parasite persistence

3. Immune function varied among individuals from different colonies
➢ Suggests a heritable component to immunocompetence, or local adaptation to geographically variable parasite component communities

References

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