Assessing the Effects of Competition and Seasonality on Stress, Immunity, and Number of Scars in Deer Mice

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Infectious wildlife diseases are becoming more common, causing population declines and species extinctions. Ecological and environmental stressors can influence disease spread in wildlife, through effects on parasite transmissibility (regulated by host immunity), and contact rates. Glucocorticoids (GCs) are hormones that mediate physiological and behavioral responses to stressors, and thus, can influence immunity and behavior in wildlife. Sin Nombre virus (SNV) is carried by deer mice (*Peromyscus maniculatus*), and in western Montana grasslands, deer mice compete with voles (Microtus spp.) and shrews (Sorex spp.). Because voles are dominant over deer mice, they could increase SNV prevalence in deer mice via stress-induced immunosuppression and/or alteration in contact rates, while shrews may have a lesser effect. Our objectives were to investigate whether voles and/or shrews could increase SNV prevalence in deer mice through changes in stress, immunity and/or contact rates, and to examine seasonal changes in these same measures. We live-trapped small mammals over 2 years in western Montana grasslands. We evaluated deer mice for scar numbers (proxy for contact rates), demography, and body condition scores (BCSs). Deer mouse blood was evaluated for white blood cell counts/differentials, and SNV antibodies, and feces for fecal corticosterone metabolites (FCMs) to measure stress (baseline and stress-induced). Using mixed effect regression trees, we found that higher vole density was inconsistently associated with lower BCSs and scar numbers. Higher shrew density was consistently associated with lower stress-induced FCMs, but inconsistently with lower BCSs, and higher scar numbers. Neutrophil: lymphocyte (N:L) ratios were highest in spring/summer, and lowest in fall/winter. Due to low SNV prevalence, we could not evaluate effects on infection. Interspecific competition may influence disease spread via effects on chronic stress (i.e. lower stress-induced FCMs and BCSs), and scar numbers. Higher N:L ratios, suggestive of chronic stress, over spring/summer may provide an ideal time for SNV transmission. Our findings may extend to other diseases.