
INFECTION AND IMMUNITY IN BIGHORN SHEEP METAPOPULATIONS: DYNAMICS OF PNEUMONIA

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It is widely accepted that reducing contact between domestic and wild sheep limits pneumonia introduction, where domestic sheep transmit pathogens to bighorns. However, in some places, pneumonia persists for many years, even as local domestic inholding decline. We focused on one such system, the Hells Canyon region. We used an extensive long-term dataset to assess the evidence that pneumonia-causing pathogens induce an acquired immune response in bighorn sheep by reconstructing pneumonia exposure histories, and evaluating the impact an individual's exposure history has on its survival. We found evidence of protective immunity lasting approximately two years, and saw that translocated individuals suffered much higher pneumonia risk than residents. Surviving many past pneumonia events decreased an adult's risk in future events, although lambs born to ewes with many past exposures were at higher risk than their peers. These results are consistent with a disease that produces some chronic carriers that shed to their lambs for many years. Interestingly, while we might expect that the impact of chronic carriage on a population should decline over time and allow for population recovery (through senescence of carriers), we instead saw a trend of increasing lamb pneumonia mortality. Our findings corroborate long-held hypotheses about the presence of a chronic carrier state, and suggest that better understanding specific mechanisms leading to chronic carriage will help clarify the costs and benefits surrounding various management strategies.