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Interspecific contact rates: a neglected parameter in Neglected Tropical Diseases studies?

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Abstract

Mathematical models play an important role in improving our understanding of the processes underlying the epidemiology of infectious diseases. One of the key parameters of these models is the contact rate between infectious and susceptible hosts which, despite its direct impact on the frequency of the transmission of parasites and pathogens, is often estimated but rarely measured accurately. This is particularly true for multi-species systems involving complex transmission cycles, such as most Neglected Tropical Diseases, including vector-borne zoonotic diseases, especially when they involve wildlife hosts. However, technical and analytical advances over the past decade (radio-tracking technology, spatial and network analysis,..) have provided opportunities for revising our understanding of key processes and underlying drivers of contacts between hosts. Using examples of ecological and epidemiological studies carried out in Southern Africa during the past decade, we illustrate how focusing on contact patterns allows a better understanding of processes that may result in pathogen transmission between wildlife and livestock population, with important consequences for the management of these interface areas. We use data from sympatric radio-collared African buffalos (*Syncerus caffer*) and cattle at the periphery of two protected areas in Zimbabwe to assess epidemiologically relevant direct and indirect interspecific contacts. The contact windows defined are compatible with the transmission of various pathogens including brucellosis, bovine tuberculosis and tick-borne disease. We analyse the variations in time and space of the respective contact patterns and identify key periods (seasons) and key sites (resources) that could be targeted to reduce the frequency of transmission of the parasites and pathogens of interest. Finally, we evaluate the relevance of these approaches based on interspecific contact patterns for selected Neglected Tropical Diseases in SE Asia.