Spatial behaviour, age, and sex correlate with co-infection patterns in roe deer

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Résumé

Understanding the intricate dynamics of co-infections involving both zoonotic and non-zoonotic pathogens in wildlife is essential due to potential implications for public health, economies, and ecosystems. A fundamental objective in this field is to understand the factors influencing the structuration of pathogen communities.
One such crucial factor is exposure, which represents the likelihood of host-pathogen encounters. Exposure is largely related to the spatial behaviour of hosts, encompassing their movement and activity in environments conducive to pathogen transmission. The inter-individual variability in spatial behaviour, with host susceptibility to infection, modulates infection probabilities and the formation of pathogen infra-communities within host species. Moreover, the co-presence of multiple pathogens within a single organism can lead to intricate interactions mediated by immunomodulation or competition. Hence, individual exposure and the subsequent interactions among pathogens shape diverse co-infection patterns in hosts.

To delve deeper into these phenomena, our study specifically focuses on the European roe deer, a wildlife host species known for co-infections with both livestock-shared and zoonotic pathogens. Using data from GPS tracking and pathogen prevalence, we intended to disentangle the effects of host characteristics (age and sex), spatial behaviour (home range composition and host activity) and direct/indirect pathogen interactions on the individual pathogen community. We employed a Hierarchical Bayesian model to analyse patterns of co-infection of 11 pathogens in a sample of 222 individuals captured between 2016 and 2022 in South-West France.

Age, sex, home range composition, and activity are shown as the main host variables influencing pathogen diversity and structure of the pathogen infra-community. Pathogen interactions were identified, however to a lesser extent. Our findings shed light on various aspects of the interplay between spatial behaviour, individual characteristics, and pathogen dynamics in the co-infection ecology of roe deer. These insights could offer valuable implications for both wildlife management strategies and public health considerations in understanding and mitigating the spread of infectious diseases in wildlife populations.

Mots-Clés: Co, infection, Exposure, Pathogens, Roe deer, Spatial behaviour, Wildlife