

# Ecosystem Dynamics, Biological Diversity and Their Impacts on Zoonotic Infectious Diseases

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He is currently involved in studies on the ecology of infectious diseases, specifically with respect to the temporal and spatial dynamics of disease (pertussis, measles, cholera fever, dengue fever), and their associations with climate variability, the emergence of infectious and parasitic diseases (Buruli Ulcer, cholera...), and the linkages between biodiversity alteration and ecosystem changes on disease emergence, the macroecology of parasitic and infectious diseases with a special interest in emerging patterns and the coevolutionary processes between humans and their parasitic and infectious diseases.

He has authored up to 105 articles in international journals (Nature, PloS Biology, PloS Medicine, Current Biology, Trends in Microbiology, Trends in Parasitology, Ecology Letters, American J. Epidemiology, Evolution, Ecology, International Journal of Microbiology, Journal of Evolutionary Biology, Proceedings B, Trends in Parasitology, Parasitology, International Journal of Parasitology, among others) and 75 oral communications (up to 40 as an invited speaker) in international meetings and 6 hard-books (Springer Oxford university Press, De Boeck).

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## Abstract

Understanding the influence of host species diversity on infectious disease is a key-debate due to the occurrence of zoonotic diseases in wildlife. Very rare studies have focused on the impact of biological diversity in terms of host reservoirs and vectors upon the circulation of pathogenic agents even if some investigations started to address these pitfalls. They notably underlined that host biodiversity can play a protective role in human health.

Here, in both using theory and data, we show what can be the impacts of local community species structure and composition on disease dynamics. We first study it by using empirical laws coupling local host population abundance and species richness. We then compare the predictions with real data for Lyme disease to study the influence of reservoir species community, and for West Nile Fever to disentangle the synergistic influence of vector and reservoir species communities on disease agent transmission. In addition, we show how the interactions between local biodiversity and spatial heterogeneity may affect disease transmission. In the current context of globalization, biodiversity loss and landscape homogenization, the understanding of infectious disease dynamics within complex local host species communities might be a crucial key for human health concerns.

**Keywords:** zoonotic infections, biodiversity, ecosystem dynamics, global environmental change, infectious disease emergence, disease risks