Chemical pollution and zoonotic hazards in urbanizing socio-ecosystems: the exotic house mouse as a model system in Senegal

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Résumé

Urbanization in Africa is a rapid and challenging–to–control process, which favors precarious areas where interactions between humans and rodents (major reservoirs of zoonoses) are exacerbated. In this context where humans play a key role as actors (by disturbing natural habitats) and victims (of zoonotic infections) of such an intensive urban transition, efficient mitigation of rodent-borne zoonotic exposure is instrumental for ensuring sustainable urbanizing landscapes. Astonishingly, there is a notable scarcity of research investigating the complex interplay between environmental pollution (exacerbated by habitat anthropization)

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and the "pathobiome" (i.e. the community of parasites and pathogens within a host organism, some of which may have zoonotic implications) within a single reservoir system remains scarce amidst ongoing land-use changes. Yet, anthropogenic pollution – especially through chemical elements like cadmium, lead or mercury, which are prevalent in urbanizing environments – can lead to significant alterations in immune capacity of reservoir animals with unpredictable effects on the risks associated with zoonotic transmissions. Here, we relied on an integrative, comparative approach at the interface of parasite ecology and host ecotoxicology to explore these relationships. We focused on different populations of the house mouse *Mus musculus domesticus*, a major invasive exotic species worldwide, which still currently spreads eastwards in Senegal (West Africa). Across 12 sites situated along an urban-to-rural gradient within the northern part of this country, we explored potential associations between *(i)* two components of its pathobiome (by deciphering helminth assemblages and pathogenic bacteria communities) and *(ii)* environmental pollution (by measuring concentrations of (essential and non-essential) metal and mineral elements within the livers of house mice). Using multivariate analyses and generalized linear mixed models with each rodent serving as an observational unit, we evaluated the hypothesis that rodent-borne zoonotic hazards (i.e. the prevalence and/or intensity of infectious agents) naturally varies following changes in the nature and/or concentration of chemical elements due to urban transition. Our findings provide original, critical insights into the potential alterations in the risks of zoonotic exposure carried by reservoir rodents within urbanizing contexts in Global South contexts. Ultimately, our study lays the groundwork for further understanding and mitigating these risks, contributing to public health prevention and promoting sustainable urban trajectories.

Mots-Clés: Biosentinels, Chemical pollutants, EcoHealth, Intrahost communities, Urban transition.