

Does the biodiversity hypothesis hold for wildlife health? Exposure effects of urban and pristine forest soils on wild rodent microbiota

Esa Koskela¹, Heidi C. Hauffe², Phillip C. Watts¹, Giulio Galla², Toni Jernfors², Eva Kallio¹, Tapio Mappes¹

¹University of Jyväskylä, Finland, ²Fondazione E. Mach, Italy

The biodiversity hypothesis asserts that the diversity of living organisms in ecosystems has a positive impact on human health, while urbanization leads to a depleted host microbiota, immune dysfunction, chronic inflammation, and finally clinical disease. However, while urban areas are the most rapidly expanding ecosystems on Earth forcing wildlife to disperse or adapt to new environments, little is known how the biodiversity hypothesis holds for wild animal species. Using a well-studied wild rodent, the bank vole (*Myodes glareolus*), we test the hypothesis that environmental biodiversity affects wildlife health by promoting microbiota function at the host-microbiota interface (intestinal mucous layer) and reducing inflammation. Laboratory-born bank vole offspring were exposed to soil mixtures of urban forests and pristine forests (with sterile bedding as control) for four weeks in individually ventilated cages and monitored for changes in gut microbiota and function of gut flora. We found clear effects of anthropogenic disturbance on forest soil pH and microbial communities, with urban forest soils harbouring distinct and more diverse soil microbiota composition than pristine forests (alpha and beta diversity of bacteria). Soil treatments decreased species evenness and caused shifts in beta diversity in individual faecal samples compared to sterile controls. Measures of generic inflammation markers are currently under study. Whereas human disturbance has clear effects on forest soil microbiota composition, associations between the type of soil microbes and soil microbial biodiversity per se with host health are not easily understood, especially when considering the effects on wildlife.