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# Allergens in the City: Effects of novel plant communities on seasonal pollen allergies in urban areas

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## Abstract

Pollen allergies are a leading cause of chronic disease affecting over 20% of adults in Europe. Allergy prevalence have been on the rise in the past decades, particularly in cities. This increase seems largely driven by global changes: air pollution increase human sensitivity to allergens; warmer temperatures and increased atmospheric CO<sub>2</sub> increase yearly pollen production; and the introduction of plant species outside their native range spreads novel allergens – i.e. allergens previously absent from the resident flora. In this context, urbanization – where warmer temperatures, pollution and thriving neophyte invasions shape novel urban ecosystems – is a rapidly changing terrain of allergenic potential.

We investigated how allergenic properties of grasslands change with urbanization in Berlin, Germany. We expected the more urban and neophyte-invaded grasslands to exhibit the highest allergy risk. In 2017, we recorded plant species abundance in 56 plots of grasslands covering a double gradient of urbanization and neophyte invasion. We collected publicly available data on flowering phenology and allergenic properties of 234 plant species, including specific allergenic pollen molecules. Borrowing from trait-based community ecology, we developed new methods to characterize the mean allergenic potential, diversity and seasonal spectrum for each community along the urban-rural gradient.

Urban grasslands of Berlin were not more allergenic than rural ones. Neophytes and Natives were as frequently allergenic (35%). However, neophyte-rich urban grasslands produced a higher diversity of allergenic molecules. Both natives and neophytes contributed to a wider spectrum of molecules in the city, possibly affecting a wider range of people. Increasing human population densities in cities imply that novel allergens may cause more harm in urban than rural conditions. Cities may yet remain a relative haven for people suffering from hay fever, but efforts to identify novel risks and control them early should be a priority in urban nature management.

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