

Artemisia pollen is the main vector for airborne endotoxin (Oteros et al., 2018-in press; J Allergy Clin Immunol)

Abstract:

Endotoxins (lipopolysaccharides, LPS) released from Gram-negative bacteria exert strong immunologic and inflammatory effects and when airborne may contribute to respiratory conditions such as allergic asthma.

We determined LPS in outdoor air on a daily basis for a period of 4 consecutive years in Munich and Davos. Air was sampled as Particulate Matter PM_{>10}µm and 10>PM_{>2.5}. Over 60% of the annual endotoxin exposure was detected in the PM_{>10} fraction showing that bacteria do not aerosolize as independent units or aggregates, but adhered to very large particles. In Munich, the endotoxin exposure was highest in summer, with 70% of the annual exposure detected between June 12th and August 28th. Multivariate modelling showed that endotoxin levels could be explained by phenological parameters i.e. plant growth. Indeed, days with high airborne endotoxin levels correlated well with the amount of *Artemisia* pollen in the air. Pollen collected from plants across Europe (100 locations) showed that the highest levels of endotoxin were detected on *Artemisia vulgaris* (mugwort) pollen, with little on other samples. Microbiome analysis showed that LPS concentrations on mugwort pollen were related to the presence of *Pseudomonas* spp. and *Pantoea* spp. communities. In a mouse model of allergic disease, the presence of LPS on mugwort pollen was critical for allergic sensitization.

The majority of airborne endotoxin stems from bacteria dispersed with pollen of only one plant: mugwort. In addition of LPS being health relevant, we show that pollen is an important ecological vector for the airborne dispersal of bacteria.

