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V03 Factors affecting allergenicity of birch pollen from different environmental conditions and associated health effects

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Background: Climate change influences the growth, pollen production and allergenicity of plants.

Stressful environmental conditions can change pollen characteristics and influence the severity of allergic respiratory diseases. **Aim of study:** To investigate pollen from birch trees in different climatic conditions and to assess the molecular composition and skin prick test (SPT) response of allergic patients will help us to understand the underlying mechanisms that influence pollen allergenicity and to predict and manage allergic diseases in the face of climate change. **Methods:** Pollen samples from birch trees from different geographic locations across Europe were obtained from 2019 to 2021. We gathered information on abiotic (air temperature, relative humidity, UV radiation, air pollution) and biotic factors (tree growth parameters, virus infection), generated standardized pollen extracts, and correlated the environmental and tree-specific data with allergenicity parameters (total protein, Bet v 1, lipid mediators, endotoxin, serotonin, histamine) and the result of double blind, controlled SPT. **We studied pollen of trees in 3 settings:** genetically identical birch trees in 40 International Phenological Gardens across Europe (region of interest-1; ROI-1); different clones in a seed plantation to minimize climatic variation (ROI2); trees along an altitude

gradient with a variety in genetic background and climatic conditions (ROI-3). **Results:** Across all ROIs, expectedly, severity of the SPT reaction (wheal size) correlated significantly and positively with Bet v 1. Interestingly, however, in ROI-1 and-2, wheal size was even stronger correlated with the total protein content than with Bet v 1. Moreover, wheal size showed a significant and negative correlation with longitude and altitude of the tree's location, whereas temperature was not correlated with allergenicity (ROI-1). Pollen allergenicity depended on the tree's genetic background, but year-to-year variation had an even greater impact (ROI-2). **Conclusion:** Allergenicity of birch pollen appears to depend on other factors besides Bet v 1, and varies from year to year and by the tree's genetic background and regional factors. Specifically, birch trees in more eastern European regions and higher altitudes produce less allergenic pollen, which might indicate increasing allergenicity of birch trees in warmer, temperate climates, possibly due to environmental stress.