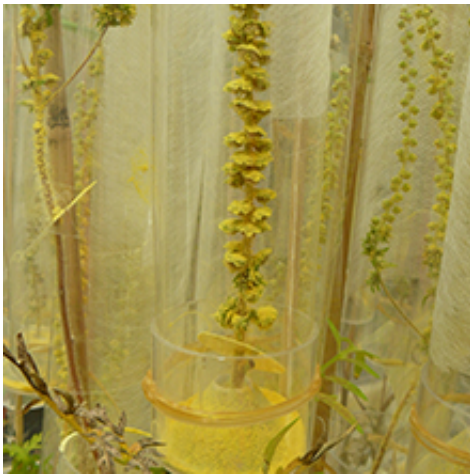


NO₂ air pollution increases allergenicity in ragweed pollen

August 17 2015



Air pollution increases allergenicity of *Ambrosia* pollen (yellow). Credit: Helmholtz Zentrum München (HMGU)

Pollen of the common ragweed (*Ambrosia artemisiifolia*) has higher concentrations of allergen when the plant is exposed to NO₂ exhaust gases, according to findings of scientists of Helmholtz Zentrum München. In addition, the study published in the journal *Plant, Cell & Environment* indicates the presence of a possible new allergen in the plant.

Together with the Research Unit Protein Science and the Institute for Environmental Medicine of Technische Universität München as well as the research consortium UNIKA-T and the Christine Kühne - Center for

Allergy Research and Education, researchers of the Institute of Biochemical Plant Pathology (BIOP) studied how nitrogen oxides affect the [pollen](#) of the plant. Specifically, they fumigated the plants with various concentrations of NO₂, which e.g. is generated during combustion processes of fuel. "Our data showed that the stress on the plant caused by NO₂ modulated the protein composition of the pollen," said first author Dr. Feng Zhao. "Different isoforms of the known allergen Amb a 1 were significantly elevated." In addition, the [scientists](#) observed that the pollen from NO₂ treated plants have a significantly increased binding capacity to specific IgE antibodies of individuals allergic to *Ambrosia*. This is often the beginning of an allergic reaction in humans.

Previously unknown allergen in *Ambrosia*

The plant researchers made another striking discovery in the pollen of the fumigated plants: During their investigations they identified a protein that was present in particular when NO₂ levels were elevated. This protein was not previously known to be an allergen in *Ambrosia*, and it has a strong similarity with a protein from a rubber tree. In this context, it was previously described as an [allergen](#) whose effect was also known in fungi and other plants. Further experiments related to this topic are currently being planned.

Stress makes pollen aggressive

"Ultimately, it can be expected that the already aggressive *Ambrosia* pollen will become even more allergenic in the future due to air pollution," said study leader Dr. Ulrike Frank, summarizing the results. She and her team at BIOP have long been conducting research on the plant, which probably once came to Europe in imported birdseed. Now it is widely dispersed here due to climate change. Ragweed pollen is very aggressive; in the U.S. it is now the main cause of hay fever and other

allergies. Since *Ambrosia* does not bloom until late summer, it thus lengthens the "season" for allergy sufferers.

"After studies have already shown that *Ambrosia* growing along highways is clearly more allergenic than *Ambrosia* [plants](#) growing away from road traffic, we could provide a reason for this," said Frank. "Since in nature and along roads hundreds of parameters could play a role, until now the situation was not entirely clear." In future studies in collaboration with UNIKA-T and the Christine Kühne - Center for Allergy Research and Education, the scientists want to show that pollen only treated with NO₂ can also elicit stronger in vivo reactions.

More information: Zhao, F. et al. (2015). Common ragweed (*Ambrosia artemisiifolia* L.): Allergenicity and molecular characterisation of pollen after plant exposure to elevated NO₂. *Plant, Cell & Environment*, [DOI: 10.1111/pce.12601](https://doi.org/10.1111/pce.12601)

Provided by Helmholtz Association of German Research Centres

Citation: NO₂ air pollution increases allergenicity in ragweed pollen (2015, August 17) retrieved 18 April 2024 from

<https://medicalxpress.com/news/2015-08-no2-air-pollution-allergenicity-ragweed.html>

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