

Joint Press Release

What impact do environmental factors have on allergies?

Newly established Mainz Center for Chemical Allergology (MCCA) investigates the chemical basis of allergies



(Mainz, 19 June 2015) Researchers of the Max Planck Institute for Chemistry and the Institute of Translational Immunology (TIM) of the University Medical Center Mainz have recently begun to work together in a newly created platform: In the Mainz Center for Chemical Allergology (MCCA) scientists from both institutes jointly investigate to which extent pollutants in the atmosphere, or the change in the composition of foods worsen allergies. This requires a deeper understanding of how allergens are modified by the environment and thus induce an altered body's immune responses. The research aims at creating the base for a better understanding of the constantly increasing number of hypersensitivities and at delineating paths for effective treatments and targeted preventative measures.

The MCCA was initiated by Professor Dr. Ulrich Pöschl, Director at the Max Planck Institute for Chemistry in Mainz, and Professor Dr. Dr. Detlef Schuppan, Head of the Institute for Translational Immunology at the University Medical Center Mainz. The scientists and physicians at the MCCA hope for a rapid progress in research on allergies and other hypersensitivities through the bundling of their expertise, which is unique in this form.

“Studies have shown that previously known allergens can change as a result of pollution or cultivation conditions and the growing of crops, which we were able to demonstrate for example, in wheat. Their characteristics can be modified and thus also the type and severity of allergies and hypersensitivities they trigger”, says Detlef Schuppan, explaining the research approach of the interdisciplinary center. The physician had discovered that the increased content of the so-called amylase trypsin inhibitors in cereals containing gluten can worsen allergies and autoimmune diseases.

“With the designation ‘chemical allergology’, we have created a new term. It describes that we do not only want to determine empirical relationships, but we also want to clarify fundamental chemical processes which are responsible for the occurrence of allergies and the influence of pollutants”, says Ulrich Pöschl, describing the relationship between the research center and the naming.

Understanding allergic processes

Dr. Kurt Lucas, Group Head of the Department of Multiphase Chemistry, has assumed the operative leadership for the Max Planck Institute for Chemistry. PD Dr. Ernesto Bockamp heads the molecular biological part of the initiative for the Institute for Translational Immunology.

Currently, the researchers are working on two subject fields together with three PhD students. On the one side, the scientists want to find out how specific inflammation processes, which worsen allergies and hypersensitivities, can be inhibited or interrupted in the human body by means of plant ingredients. “The basis for our research is the discovery that the majority of inflammatory processes in the body show a universal molecular cycle process”, says Kurt Lucas. He refers to allergy-related asthma and autoimmune diseases such as rheumatism, multiple sclerosis and inflammatory bowel diseases as examples.

Furthermore, the scientists of the MCCA are exploring the fundamental questions of what exactly turns a substance into an effective allergen or immunogen. To this end, they are studying immune-stimulating molecular characteristics of allergens, to better define why certain substances trigger the formation of antibodies or cell responses, resulting in an allergy. The focus lies on the type and extent to which the inflammation-promoting effect of known pollen or food allergens is increased by chemical changes. For example, allergens can be chemically altered by ozone or nitrogen oxide in the atmosphere, but also by catalytic reactions that are promoted on microscopic dust particles.

Although the scientists have only recently started the joint investigations, they have already obtained promising first results. In particular, they could identify a number of anti-inflammatory plant extracts that inhibit specific cellular inflammation sensors, the so-called “Toll Like” receptors. Currently the active ingredients of these extracts are being characterized.

Figure:

Hazel pollen often causes allergies as early as February since the plant flowers early in the year. The electron microscopic picture of hazel pollen was taken at the Max Planck Institute for Chemistry.

Picture: Antje Sorowka, Max Planck Institute for Chemistry

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About the Max Planck Institute for Chemistry

The goal of the Max Planck Institute for Chemistry is an integral scientific understanding of chemical processes in the Earth System from molecular to global scales. Current research at institute aims at an integral understanding of chemical processes in the Earth system, particularly in the atmosphere and biosphere. Investigations address a wide range of interactions between air, water, soil, life and climate in the course of Earth history up to today's human-driven epoch, the Anthropocene. Currently, the institute employs some 300 staff in four departments (Atmospheric Chemistry, Biogeochemistry, Multiphase Chemistry, and Particle Chemistry) and additional research groups. In honor of the former director and president of the Max Planck Society, the Max Planck Institute for Chemistry also carries the epithet Otto Hahn Institute. It was founded in 1912 as the Kaiser Wilhelm Institute for Chemistry in Berlin, and it was relocated to Mainz in 1949.

About Mainz University Medical Center

Working together in exemplary interdisciplinary fashion, Mainz University Medical Center comprises more than fifty clinical departments, institutes and divisions and operates over 1,600 beds. As the only University Medical Center in the state of Rhineland-Palatinate we offer healthcare to the highest university standard. By applying our scientific knowledge and long-standing experience in medical care within modern facilities, we are always keen to help patients in the best possible way - according to our motto: Our Expertise for Your Health!