



Pollen Allergy and Air Pollution



Who are we?

Our group, located at the Braunschweig Integrated Centre of Systemsbiology (BRICS), is interested in the role of metabolism during inflammation. This includes macrophage metabolism during infection but on the other hand also the role of microglia cells during neuro-degeneration as well as neuronal metabolism in general.

The team has developed a strong expertise in stable-isotope assisted metabolomics and metabolic flux analysis both on a whole cell as well as on a mitochondrial sub-compartment level.

Project background

Pollen allergies are an increasing problem in the whole Western civilisation. The number of persons affected is growing since some decades and so do the costs for medical treatment and indirect losses of productivity. At the moment about 20 percent of the population in Europe and the USA suffer from a pollen allergy.

We are interested in the questions: Why do some persons develop allergies and others not? And why is the number of persons affected growing so dramatically?

Different causes for developing an allergy have been discussed in the past, mainly genetic factors, air pollution and inadequate exposure to bacteria and viruses in the childhood.

The course of events in allergic sensitization is well known:

First the allergen comes into contact with the mucosa of the nose and the eyes. Dendritic cells (DC) are present there in an immature state. They are well equipped to capture antigens and process them to form MHC-peptides complexes. As a consequence DCs begin to mature and migrate, expressing molecules that will lead to binding and stimulation of T helper cells in lymphoid tissues. The T helper cells activate B cells to produce IgE antibodies. IgE is then secreted into blood and coats mast cells by binding to IgE receptors on their surface producing cells that are now sensitized to the allergen. When mast cells are activated the next time by an allergen that binds to serum IgE, they release cytokines, eicosanoids and their secretory granules.

Finding the causes of allergic reactions may help to develop a strategy for avoiding allergies and saving a lot of money.

Thesis content – utilized methods

Our approach is to examine all described steps of the allergic reaction systematically:

Which step(s) differ between allergic and non-allergic persons? We will start with the dendritic cells because they are the major antigen presenting cells in allergic reactions.

It was recently found out that birch pollen can be nitrated by nitrogen dioxide from road traffic. This nitrated pollen exhibits an increased potency to trigger an immune response. Therefore we plan to face the isolated dendritic cells with nitrated birch pollen also.

A big challenge for the future is to simulate several steps or even the whole allergic reaction in vitro.

Interested?

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