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Dietary fibres protect against asthma

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The Western diet probably has more to do with the asthma epidemic than has been assumed so far because developing asthma is related to the amount of fruit and vegetables consumed. Gut bacteria ferment the dietary fibres contained in them and fatty acids enter the blood as a result, influencing the immune response in the lungs. This has been shown by a research project funded by the Swiss National Science Foundation (SNSF).

In the West, an increasing number of people have developed allergic asthma in the past fifty years. But dietary habits have also changed during the same period: fruit and vegetables are playing an ever smaller role in people's diets. Now new results suggest that these two developments are not merely simultaneous, they are also causally linked. A team of researchers led by Benjamin Marsland from Lausanne University Hospital (CHUV) has shown in experiments with mice that the lack of fermentable fibres in people's diet paves the way for allergic inflammatory reactions in the lungs.

Influence extends to the lungs

Researchers have already known for some time that the microbial diversity in the gut when digesting and fermenting fibres plays a significant role in preventing intestinal cancer. "We are now showing for the first time that the influence of gut bacteria extends much further, namely up to the lungs," says Marsland. His team either put mice on a standard diet with four percent fermentable fibres or gave them low-fibre food with merely 0.3 percent fermentable fibres. This low-fibre

food is largely comparable to the Western diet, which contains no more than 0.6 percent fibres on average.

When the researchers exposed the mice to an extract of house dust mites, the mice with the low-fibre food developed a stronger allergic reaction with much more mucus in the lungs than the mice with the standard diet. Conversely, a comparison between mice on a standard diet and mice who received food enriched with fermentable fibres likewise showed that these dietary fibres have a protective influence.

This protection is the result of a multi-level reaction chain, as Marsland's team has now shown. First the fibres reach the intestine, where they are fermented by bacteria and transformed into short-chain fatty acids. These acids then enter the bloodstream and influence the development of immune cells in the bone marrow. Attracted by the extract of house dust mites, these immune cells wander into the lungs, where they eventually trigger a weaker allergic response.

Another reason why fruit and vegetables are good for you

Marsland thinks that the results obtained by his group are clinically relevant not only because the share of plant fibres in Western diets is comparable to the low-fibre food of the mice, but also because the examined aspects of the immune system are virtually indistinguishable in mice and humans. Many questions still remain unanswered. "We plan to conduct clinical studies to find out how a diet enriched with fermentable fibres affects allergies and inflammations." It is already sufficiently clear, however, that here is another reason why one should eat more fruit and vegetables.

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Yadava, Anke K. Sichelstiel, Norbert Sprenger, Catherine Ngom-Bru, Carine G. Blanchard, Tobias M. Junt, Laurent P. Nicod, Nicola L. Harris, Benjamin J. Marsland (2014). "Gut microbiota metabolism of dietary fiber influences allergic airway disease and hematopoiesis through GPR41." *Nature Medicine*. DOI: 10.1038/nm.3444