

Study provides more clarity on the genetic causes of children's food allergies

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What role do genes play in egg, milk, and nut allergies? A study published in *Nature Communications*, led by the Max Delbrück Center for Molecular Medicine (MDC) and Charité - Universitätsmedizin

Berlin, has found five genetic risk loci that point to the importance of skin and mucous membrane barriers and the immune system in the development of food allergies.

An estimated five to eight percent of all children suffer from food allergies. They usually appear in the first years of life and manifest themselves in the form of itchy rashes and facial swellings, which occur shortly after food ingestion. Food allergies can, however, also cause severe allergic reactions involving breathing difficulties, vomiting, or diarrhea, and are the most frequent triggers of anaphylaxis in children. Anaphylaxis is the most extreme form of an immediate allergic reaction and can be life threatening.

In Germany, chicken eggs, cow's milk, and peanuts are the most common causes of allergic food reactions in children. Unlike allergies to cow's milk and chicken eggs, which often disappear after a few years, children generally do not outgrow allergies to peanuts. Peanut [allergy](#) sufferers must follow a strict diet for their entire lives and carry emergency medication with them at all times.

The causes of food allergies involve a complex interplay of genetics and environment. "Studies of twins suggest that about 80 percent of the risk for food allergies is heritable, but little is known so far about these [genetic risk](#) factors," says Prof. Young-Ae Lee, a researcher at the MDC and head of the Charité's outpatient pediatric allergy clinic.

World's largest study into the genetic causes of food allergies

A genome-wide association study examined some 1,500 children in Germany and the United States who suffer from food allergies. The research looked at more than five million genetic variations, called single nucleotide polymorphisms or SNPs (pronounced "snips"), in each participant in the study and compared the frequency of these SNPs with

that of the control subjects. The study, which was published in *Nature Communications*, involved researchers from Berlin, Frankfurt, Greifswald, Hanover, Wangen, and Chicago. It is remarkable not only for its size but also for its reliable diagnostic methodology.

Unlike other studies, the researchers used an oral food challenge test to confirm the allergy diagnosis. This is a complex procedure in which patients ingest small amounts of the suspected allergen in the hospital under emergency conditions to determine if they respond allergically to it. "We know from clinical practice that as many as 80 percent of presumed food allergies are not actually allergies. These food sensitivities are frequently due to food intolerance rather than an allergic response," says Prof. Lee.

This study discovered a total of five genetic risk loci for food allergies. Four of them show a strong correlation with known loci for not only atopic dermatitis and asthma, but also for other chronic inflammatory diseases like Crohn's disease and psoriasis as well as autoimmune disorders.

New risk locus associated with all children's food allergies

The so-called SERPINB gene cluster on chromosome 18 was identified as a specific genetic risk locus for food allergies. It involves ten members of the serine protease inhibitor (serpin) superfamily. The genes in this cluster are expressed primarily in the skin and in the mucous membrane of the esophagus. The researchers thus suspect that they play a major role in ensuring the integrity of the epithelial barrier function. Another important finding of the study is that four of the five identified risk loci are associated with all food allergies. The human leukocyte antigen (HLA) region, which is specific to peanut allergy cases, appears to be the only exception.

The study provides a basis for the development of better diagnostic tests for food allergies and for further investigation into their causative mechanisms and possible treatment strategies. Parents should not make decisions about avoiding specific foods on their own, but should instead seek out a specialist if their child appears to have a [food](#) allergy.

More information: Ingo Marenholz et al, Genome-wide association study identifies the SERPINB gene cluster as a susceptibility locus for food allergy, *Nature Communications* (2017). [DOI: 10.1038/s41467-017-01220-0](#)

Provided by Max Delbrück Center for Molecular Medicine

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