

Early exposure to antibiotics can cause permanent asthma and allergies

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Early exposure to antibiotics kills healthy bacteria in the digestive tract and can cause asthma and allergies, a new study demonstrates.

The study, published in *Mucosal Immunology*, has provided the strongest evidence so far that the long-observed connection between antibiotic

exposure in [early childhood](#) and later development of asthma and allergies is causal.

"The practical implication is simple: Avoid [antibiotic use](#) in [young children](#) whenever you can because it may elevate the risk of significant, long-term problems with allergy and/or asthma," said senior author Martin Blaser, director of the Center for Advanced Biotechnology and Medicine at Rutgers.

In the study, the researchers, who came from Rutgers, New York University and the University of Zurich, noted that antibiotics, "among the most used medications in children, affect gut microbiome communities and metabolic functions. These changes in microbiota structure can impact host immunity."

In the first part of the experiment, five-day-old mice received water, azithromycin or amoxicillin. After the mice matured, researchers exposed them to a common allergen derived from [house dust mites](#). Mice that had received either of the antibiotics, especially azithromycin, exhibited elevated rates of immune responses—i.e., allergies.

The second and third parts of the experiment tested the hypothesis that [early exposure](#) to antibiotics (but not later exposure) causes allergies and asthma by killing some healthy gut bacteria that support proper immune system development.

Lead author Timothy Borbet first transferred bacteria-rich fecal samples from the first set of mice to a second set of adult mice with no previous exposure to any bacteria or germs. Some received samples from mice given azithromycin or amoxicillin in infancy. Others received normal samples from mice that had received water.

Mice that received antibiotic-altered samples were no more likely than

other mice to develop immune responses to house dust mites, just as people who receive antibiotics in adulthood are no more likely to develop asthma or allergies than those who don't.

Things were different, however, for the next generation. Offspring of mice that received antibiotic-altered samples reacted more to house dust mites than those whose parents received samples unaltered by antibiotics, just as mice that originally received antibiotics as babies reacted more to the allergen than those that received water.

"This was a carefully controlled experiment," said Blaser. "The only variable in the first part was antibiotic exposure. The only variable in the second two parts was whether the mixture of gut bacteria had been affected by antibiotics. Everything else about the mice was identical.

Blaser added that "these experiments provide strong evidence that [antibiotics](#) cause unwanted immune responses to develop via their effect on gut bacteria, but only if gut bacteria are altered in early childhood."

More information: Timothy C. Borbet et al, Influence of the early-life gut microbiota on the immune responses to an inhaled allergen, *Mucosal Immunology* (2022). [DOI: 10.1038/s41385-022-00544-5](https://doi.org/10.1038/s41385-022-00544-5)

Provided by Rutgers University

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