Research suggests early life antibiotic increases asthma risk, providing clues to potential prevention of adult asthma

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Early exposure to antibiotics can trigger long term susceptibility to asthma, according to new research from Monash University.

Importantly, the research team isolated a molecule produced by gut bacteria that in the future could potentially be trialed as a simple treatment, in the form of a dietary supplement, for children at risk of asthma to prevent them developing the disease.

Asthma affects over 260 million people globally and causes around 455,000 deaths annually.

The research led by Professor Ben Marsland and published in the journal *Immunity* found a molecule, called IPA, that is crucial to long term protection against asthma.

Importantly, the finding of the molecule produced by bacteria in a healthy gut provides an explanation as to why the recurrent use of antibiotics increases the risk of asthma, according to Professor Marsland.

"We know that recurrent use of antibiotics early in life disrupts a person's healthy gut microbiota and increases the risk of allergies and asthma. We have discovered that a consequence of antibiotic treatment is the depletion of bacteria that produce IPA, thus reducing a key molecule that has the potential to prevent asthma," he said.

The first years of life are important in developing a stable gut microbiota, according to Professor Marsland. "It is shaped first by food intake—both milk and solid foods—as well as genetics, and environmental exposures. Infants at high risk of allergies and asthma have been shown to have a disrupted and delayed maturation of the gut microbiome," he said.

"The use of antibiotics in the first year of life can have the unintentional effect of reducing bacteria which promote health, and we now know from this research that antibiotics lead to reduced IPA, which we have

found is critical early in life as our lung cells mature, making it a candidate for early life prevention of allergic airway inflammation. "

Working in mice predisposed to develop asthma, the research team found that—when given antibiotics in early life—the mice were more susceptible to house-dust mite-induced allergic airway inflammation and this lasted into adulthood. Asthma is commonly triggered by exposure to house dust mite.

This susceptibility was maintained long-term, even after the gut microbiome and IPA levels returned to normal, highlighting that this molecule's function was particularly important early in life.

When these mice had their diet supplemented with the IPA molecule early in life, the researchers found that the mice were effectively cured of developing the house dust mite induced allergic airway inflammation, or asthma, in adulthood.

More information: Antibiotic-driven dysbiosis in early life disrupts indole-3-propionic acid production and exacerbates allergic airway inflammation in adulthood, *Immunity* (2024). DOI: 10.1016/j.immuni.2024.06.010. www.cell.com/immunity/fulltext … 1074-7613(24)00316-9

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