

# Why does eczema often lead to asthma?

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Many young children who get a severe skin rash develop asthma months or years later. Doctors call the progression from eczema, or atopic dermatitis, to breathing problems the atopic march. In this week's issue of *PLoS Biology*, scientists at Washington University School of Medicine in St. Louis report another step taken towards understanding the process of atopic march. Their findings show that a substance that is secreted by damaged skin can circulate through the body and trigger asthmatic symptoms in laboratory mice when exposed to eczema-causing or dermatitis-causing agents, also known as allergens.

The researchers suggest that early treatment of [skin](#) rash and inhibition of the trigger substance might block asthma development in young patients with eczema.

"Over the years, the clinical community has struggled to explain atopic march," says study author Raphael Kopan, Ph.D., professor of developmental biology and of dermatology. "So when we found that the skin of mice with an eczema-like condition produced a substance previously implicated in asthma, we decided to investigate further. We found that the mice also suffered from asthma-like responses to inhaled allergens, implicating the substance, called TSLP, as the link between eczema and asthma."

The researchers found that cells in damaged skin can secrete TSLP (thymic stromal lymphopoietin), a compound capable of eliciting a powerful immune response. The skin is effective at secreting TSLP into the blood system, and therefore the substance is transported around the

body. When it reaches the lungs, it renders them very sensitive to allergens, which is characteristic of asthma.

Led by doctoral student Shadmehr (Shawn) Demehri, the researchers studied mice that had been engineered with a [genetic defect](#) in patches of their skin. In the affected areas, the typically ordered layers of [skin cells](#) were disrupted, creating a condition similar to eczema. The defective skin secreted TSLP as part of an alarm system that alerts the body that its protective barrier function has failed. Thus TSLP activates an immune response that fights invaders.

Operating on the assumption that other barrier organs such as the lung will understand this alarm, the researchers tested what happened when the mice with skin defects inhaled an [allergen](#). They found that their lungs reacted strongly — their breathing became labored and their lung tissue took on the traits that mark asthma in humans: mucous secretion, airway muscle contraction, invasion by white blood cells and conversion of lung cells from one type to another. Additional experiments showed that mice that had normal skin but were engineered to overproduce TSLP also developed the asthma-like symptoms.

"We are excited because we've narrowed down the problem of atopic march to one molecule," Kopan says. "Now it will be important to address how to prevent defective skin from producing TSLP. If that can be done, the link between eczema and asthma could be broken."

TSLP is also produced in lungs of asthma patients, and Kopan says that research in the skin could eventually lead to ways to interfere with TSLP made in the lungs and thereby ease asthma development even in cases that aren't linked to eczema.

More information: Demehri S, Morimoto M, Holtzman MJ, Kopan R (2009) Skin-Derived TSLP Triggers Progression from Epidermal-

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