

Inability to combat oxidative stress may trigger development of asthma

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An impaired ability to handle oxidative stress that arises from exposure to secondhand smoke and other environmental triggers may contribute to the development of asthma, according to results obtained from the Shanghai Women's Health Asthma and Allergy Study. The results of the study suggest regulating the body's antioxidant defense system may play an important role in asthma prevention.

The study will be presented at the ATS 2011 International Conference.

"We found that the host antioxidant defense system is compromised among those destined to develop asthma, and therefore these individuals may be less able to handle [environmental exposures](#) that may cause asthma," said study author Emma Larkin, PhD, research assistant professor at Vanderbilt University Medical Center. Tina Hartert, MD, MPH, also of Vanderbilt, served as lead investigator of the study, which was funded by the National Institutes of Health and the National Institute of Allergy and [Infectious Diseases](#).

"Oxidative stress, which is a relative increase of oxidants over antioxidants, is known to be important in many diseases, including asthma," said Dr. Larkin, who is also a member of the Center for Asthma & Environmental Sciences Research at the medical center. "It's a battle between charged oxygen species that produce damage and our body's ability to fight them off."

Dr. Larkin said humans have two ways of building the antioxidant

defense: by improving dietary intake of antioxidants (for example, Vitamins A, C and E), called the "non-enzymatic approach;" and by strengthening the host defense system to more effectively use antioxidant enzyme activity to remove oxidants from the system, or the "enzymatic approach."

"In our study, we took a multi-step approach to understanding the development of asthma, by looking at the enzymatic and the non-enzymatic ways that the body manages oxidative stress in the development of adult-onset asthma," Dr. Larkin said. "Specifically, we focused on the enzymatic defense system that precedes the onset of asthma symptoms and diagnosis."

The researchers collected data from 65,732 women with no history of asthma who completed standardized questionnaires about asthma diagnoses and symptoms on two occasions following enrollment. From this group, the researchers selected 150 women with confirmed new development of asthma and 294 healthy controls. Levels of antioxidants and other enzymes associated with oxidative stress were measured from blood and urine samples prior to asthma development. Questionnaire data indicated 96 percent of the women were never-smokers and 44 percent were exposed to [secondhand smoke](#) through husbands or workplace exposure.

"Exposure to secondhand smoke increases the risk of asthma, and we believe that our ability to combat the detrimental effects of environmental exposures such as secondhand smoke through antioxidant enzyme defense is very important," Dr. Larkin said.

The researchers found that increased host antioxidant defense enzyme activity measured prior to disease onset was associated with a reduction in risk of asthma. Specifically, high levels of an enzyme that prevents the formation of platelet-aggregating factor (PAF), which is linked with

asthma, were associated with a decreased risk of asthma.

Dr. Larkin said the study is the first incidence study to assess the role of antioxidant defense on asthma risk, and may help researchers develop treatments to help prevent the development of asthma in patients who are at risk for the disease.

"Because this study helps us understand what is occurring in the body prior to the development of symptomatic asthma, the results may point us to nutrients or classes of drugs that could be studied to prevent asthma in those who are high-risk," she said.

"There are a lot of data on the dietary intake of antioxidants and levels of [antioxidants](#) in the blood – the non-enzymatic defenses," she added. "By focusing on the enzymatic defenses, this study helps give us a clearer picture of the complete [asthma](#) development process.

Provided by American Thoracic Society

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