

Dusty secrets could help asthma sufferers

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Asthma rates are much lower among children growing up in Amish farming communities compared to the average of industrialized societies. Credit: Courtesy of Ian Lamont/Wikimedia Commons

Researchers in the University of Arizona's BIO5 Institute have entered

into a collaboration with Johnson & Johnson Consumer & Personal Products and Janssen Biotech Inc. to leverage foundational discovery research aimed at determining environmental factors that underlie asthma and allergies.

The project's goal is to identify compounds present in dust in the farm environment that may be protective against asthma. Findings from this study could lead to the development of medicines to prevent the disease.

While asthma is known to have a genetic component, the recent dramatic increase in its prevalence across westernized countries cannot be due to this factor alone, suggesting that environment plays a major role. Asthma, the most prevalent childhood disease, affects more than 278 million people worldwide and predisposes individuals to a range of serious consequences later in life. Yet, current approved therapies address only symptoms and do not halt disease progression.

'This important study seeks to determine which environmental factors predispose for—or protect against—respiratory diseases like asthma,' said Dr. Fernando Martinez, UA Regents' professor of pediatrics and director of both the BIO5 Institute and the Arizona Respiratory Center. 'As a result, we will know which exposures ought to be avoided, and which natural environmental products could be transformed into medicines that promote lung health and prevent asthma.'

Principal investigators on the study include Martinez, as well as Dr. Donata Vercelli, professor of cellular and molecular medicine in the UA College of Medicine, and Shane Snyder, professor of chemical and environmental engineering, who holds joint appointments in the UA Colleges of Agriculture and Life Sciences and Public Health. All are BIO5 members.

The critical nature of early childhood environmental exposures in asthma

development has been well documented in previous studies that revealed strong protection against asthma in children raised on traditional animal farms in Alpine Europe and in the United States. Children exposed to farm life early on, specifically those coming in contact with livestock, hay and silage, show a much lower prevalence of asthma (1.4 percent) compared with almost 12 percent among children from non-farming environments.

Recent studies by Martinez, Vercelli and collaborators showed that similar differences in asthma prevalence are found in two unique U.S. farming populations, the Indiana Amish and the South Dakota Hutterites. While both communities share a lifestyle known to affect asthma risk, the Amish live on single-family traditional farms and use horses for work and transportation, whereas the Hutterites live on large, communal farms and embrace modern farming technology. Interestingly, the percentage of Amish children suffering from asthma is much lower (5.2 percent) than the 15 percent of Hutterite children.

In collaboration with Johnson & Johnson Consumer & Personal Products and Janssen immunology scientists, the UA researchers will conduct studies using dust samples obtained from Amish and Hutterite communities, with the aim of identifying which specific compounds may be protective against asthma or allergies.

The team is uniquely poised to tackle this study. Its work began in 2012, when collaborators Dr. Mark Holbreich in Indianapolis and Carole Ober at the University of Chicago collected airborne house dust samples in Amish and Hutterite homes. Studies using a mouse model of asthma that was developed in Vercelli's lab then revealed that inhalation of Amish dust extracts was sufficient to strongly protect the mice from asthma-like changes in the lungs. Even more striking, administration of Amish dust extracts suppressed genes that underpin allergic lung inflammation, whereas gene activity in mice exposed to Hutterite dust remained

unchanged.

'Although we don't know what substances in dust are responsible for these effects, it is likely that it is not a single compound,' Vercelli said. 'Rather, we expect a complex mix, because the effects we see are extremely pronounced.'

One of the goals of the collaboration is to dissect the biological responses triggered by exposure to the 'protective' compounds in dust to learn what the mechanisms are, so they can inform the development of new therapies, she said. Although too early to tell at this stage, possible findings include agents that protect against existing asthma and agents that prevent asthma.

'What we see in reality in the farming population is prevention,' Vercelli said. 'It's not like they develop asthma, and once they have it, it gets milder. They just never get it.'

'We are hoping to find a protective agent, and whether this is something that can also be used to treat existing asthma, we have to see.'

While studies have shown that [asthma](#) begins early in life, data also suggest that environmental exposure is probably important throughout life, Vercelli explained. 'There is something to be said for maintaining that environmental pressure. This has not been studied very carefully, and it is something we are going to learn from this study.'

The study hinges on the team's interdisciplinary expertise and technology, with Vercelli and Martinez focusing on the clinical aspects and Snyder bringing to the table technology and expertise in analyzing particulates and dust.

'Finding the links between genetic disposition and environmental triggers

makes the pairing of clinical practice and basic research all the more important,' Martinez said. 'Interdisciplinary, translation-minded entities like the BIO5 Institute and the Arizona Respiratory Center encourage colleagues from different backgrounds to collaborate on ideas and protocols that address both scientific and clinical applications. The UA is focused on creating the type of environment, facilities and collaborations needed to make outcome-based research a reality.'

Johnson & Johnson Innovation, LLC will highlight the collaboration as one of its new alliances with life science companies and research institutions around the globe to explore early-stage innovation just ahead of the BIO International Convention, to be held June 15-18 in Philadelphia.

Provided by University of Arizona

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