

Asthma tied to bacterial communities in the airway

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Asthma may have a surprising relationship with the composition of the species of bacteria that inhabit bronchial airways, a finding that could suggest new treatment or even potential cures for the common inflammatory disease, according to a new UCSF-led study.

Using new detection methods, researchers learned that the diversity of microbes inside the [respiratory tract](#) is far vaster than previously suspected – creating a complex and inter-connected microbial neighborhood that appears to be associated with [asthma](#), and akin to what has also been found in inflammatory bowel disease, vaginitis, periodontitis, and possibly even obesity.

Contrary to popular belief, the scientists also learned that the airways are not necessarily entirely sterile environments, even in healthy people, while the airways of asthmatics are infected by a richer, more complex collection of bacteria. These findings could improve understanding of the biology of asthma, and potentially lead to new and much-needed therapies.

"People thought that asthma was caused by inhalation of allergens but this study shows that it may be more complicated than that – asthma may involve colonization of the airways by multiple bacteria," said study co-author Homer Boushey, MD, a UCSF professor of medicine in the division of Pulmonary and Critical Care Medicine.

The study is published online in the *Journal of Allergy and Clinical*

Immunology.

Asthma is one of the most common diseases in the world, with approximately 300 million asthmatics globally, including 24 million in the United States, according to the Centers for Disease Control. The disease has been on the rise for the last 60 years.

"It has gone from 3 percent of the population to slightly more than 8 percent of the population in the U.S.," said Boushey. "It is most prevalent in western, developed nations – and we don't know why."

In recent years, scientists began studying communities of mixed-species microorganisms (microbiome) found in both diseased and healthy people to better understand their role in a variety of diseases. But research on the microbiome in respiratory disease is relatively uncharted terrain.

"We know fairly little about the diversity, complexity and collective function of bacteria living in the respiratory tract, and how they might contribute to diseases like asthma," said Yvonne J. Huang, MD, the paper's first author. She is a research fellow and clinical instructor in the UCSF Pulmonary Division.

"Traditionally, the airways have been thought to be sterile. However, this study suggests this is not the case. Certain asthma patients who require inhaled corticosteroid therapy possess a great abundance of bacteria compared to healthy individuals, and have an increased relative abundance of specific organisms that is correlated with greater sensitivity of their airways."

In their three-year pilot project, the scientists collected samples from the airway linings of 65 adults with mild to moderate asthma and 10 healthy subjects. Then, using a tool that can identify approximately 8,500 distinct groups of bacteria in a single assay, the scientists profiled the

organisms present in each sample to look for relationships between bacterial community composition and clinical characteristics of the patients' asthma.

The researchers found that bronchial airway samples from asthmatic patients contained far more bacteria than samples from healthy patients. The scientists also found greater bacterial diversity in the asthmatic patients who had the most hyper-responsive or sensitive airways (a feature of asthma).

"People have viewed asthma as a misdirected immune reaction to environmental exposures, but few have thought of it in the context of airway microbiota composition," said senior author Susan Lynch, PhD, an assistant professor of medicine and director of the UCSF Colitis and Crohn's Disease Microbiome Research Core in the division of gastroenterology.

"We took an ecological approach, considering the bacteria in the context of their microbial neighborhoods to identify relationships between characteristics of these communities and features of the disease... This new approach will help us to better understand the microbiota-host relationships that define human health."

The authors say that further studies are needed to determine how these specific [bacteria](#) identified in the study may influence the cause and development of asthma.

More information:

[http://www.jacionline.org/issues?issue_key=S0091-6749\(10\)X0018-5](http://www.jacionline.org/issues?issue_key=S0091-6749(10)X0018-5)

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