

# A Breath of Fresh Air

The official newsletter of the  
NIH/NHLBI Severe Asthma Research Program

## Update from the Editor

On behalf of the investigators, coordinators and staff from the National Heart, Lung and Blood Institute's Severe Asthma Research Program (SARP), I am happy to present you with the third edition of our newsletter. We have a lot of exciting news to share with you about SARP!



*Spring is here!*

Most importantly, we have finally achieved our enrollment goal of 700 children and adults with asthma! We remain grateful to each and every one of you for enrolling in the program. We are also very pleased with the diverse features of SARP participants. Thanks to you, SARP now includes real-world people with asthma across all backgrounds in the United States. Over the next few months, we will be writing a paper that describes the features of asthma in these participants. We hope to learn how asthma changes from childhood into adulthood. We are also writing reports that describe the pattern of asthma attacks and the response to the injectable "steroid" medication (called triamcinolone) in our participants. These reports will answer important questions about severe asthma that may help physicians better treat the disorder in the future.

Many of you had asthma attacks this winter because of the cold weather and viral infections, but spring is finally on the way. For some people, this season brings sunshine but also worsened allergies with increased secretions. This issue of the newsletter is dedicated to help you understand the properties of the congestion (or mucus) you often experience due to infections and spring allergies. We hope that this information will be helpful to you and your families.

Thank you again for your journey with us in SARP!

*-Anne Fitzpatrick, PhD, APRN, Emory University, Atlanta, GA*



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### Research Spotlight: What's stuck in there?

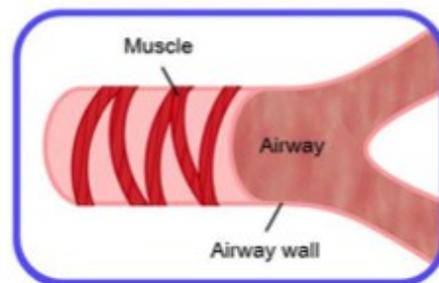
*Do you have thick, sticky mucus when your asthma gets bad? Do you cough and cough but find you can barely bring up any mucus from your chest? While healthcare providers have known for a long time that mucus plays a role in asthma, it is only recently that we've begun to explore how mucus affects and when and why it becomes a problem.*

#### Healthy versus Sick Mucus

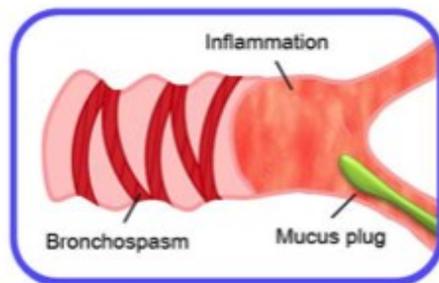
Mucus in the airway is not always a bad thing. In fact, healthy lungs need mucus to protect their delicate tissues from injury caused by toxins, germs, and other particles in the air we breathe. Healthy mucus is a gel comprising a complex network made up of 97% water and 3% protein, salts, and fats. It is the job of this mucus to capture offensive particles from inhaled air; the trapped particles are then moved to the top of the airway by little hair-like projections in the lungs, called cilia. Coughing is the final step in moving the trapped particles and mucus out of the airways.

So why is mucus in the lungs of people with asthma such a problem? Research on the properties of mucus has revealed that while the mucus from healthy airways contains only 3% solids, mucus from sick airways can contain as much as 15% solids. People with asthma tend to overproduce proteins in their airways in response to inhaled allergens; and these proteins contribute to the greater than normal amount of solids in their mucus. The more solids there are in mucus, the less water it contains, and the stickier it is. Sticky mucus, as many people with asthma will tell you, can be much harder to clear from the airways with coughing.

But the increased stickiness of sick mucus is just the start of the problem. Cilia, those little hair-like projections that help move mucus to the top of the airway, work their best when mucus is made of mostly water. In fact, normal cilia can move mucus as fast as one millimeter per minute, which is pretty fast for something you can't even see with your naked eye! But cilia are sensitive to environmental irritants and chemicals produced by inflamed airways, which can slow them down. Asking slow cilia to clear sticky mucus is a tall order!



Normal Airway



Asthmatic Airway

**Mucus plugs can become a very serious problem during an asthma attack. During a severe attack, the mucus can block the airways and cause blood oxygen levels to fall.**

## FEATURE ARTICLE continued

When mucus can't be cleared, it starts to collect in the airways, and can form mucus plugs. Mucus plugs block small airways, which can increase the risk of airway infections and decrease the amount of oxygen that is transported from the lungs into the body. In fact, mucus plugs can cause atelectasis, a complete or partial collapse of the tiny air sacs in the lungs. Mucus plugs can become a very serious problem and are almost always found in people who have nearly died from asthma.

### SARP Mucus Research

Dr. John Fahy, lead investigator of the SARP partnership at the University of California, San Francisco, is heading new research on the role of mucus in severe asthma. His research team is using a rheometer, an instrument that measures the thickness and stickiness of mucus from SARP participants. Using this technology, his team can evaluate the relationship between very sticky mucus (as measured by the rheometer) and measures of lung function. Already they are finding that sticky mucus occurs more frequently in participants who have lower lung function. The hope is that treating the sticky mucus might improve lung function at least in a subset of asthmatics.

In addition to measuring the stickiness of mucus in severe asthmatics, Dr Fahy and his team are examining chest CT scans from SARP participants for evidence of mucus in the bronchial tubes of the lung. They are finding that a significant number of asthmatics have mucus in their lungs, and they are in the process of determining if this mucus has an effect on lung function or on the effectiveness of albuterol treatment. "It is our hope that emphasis on the important role of sticky mucus in asthma will suggest new approaches to treatment" says Dr. Fahy. This research to better understand mechanisms of disease in severe asthma and to point out new ways to treat asthma could not happen without the help of those who volunteer for research studies, like the SARP. For that, the Fahy Lab and the SARP network at-large are very grateful.

- The amount of solids in mucus determines how easy it is for the mucus to be coughed from the lungs.
- An allergic reaction in the lung can make the mucus more solid and sticky.
- Coughing and asthma medications are the most effective ways to move mucus out of the airways.



Dr. John Fahy, left, with his research team at UCSF.

*To follow the work of Dr. John Fahy and his team, you can visit his website at:  
<http://cvri.ucsf.edu/~fahy/>*