Severe asthma may be a different form of the disease

January 29 2008

A multi-center research project to investigate severe asthma has found a key physiological difference between severe and non-severe forms of the disease, a finding that could help explain why those with severe asthma do not respond well to treatment.

The study from the Severe Asthma Research Program (SARP) has found that those with severe asthma are much more likely to show signs of “air trapping” in the lungs, a condition that prevents a full exhalation. The study also found that those who have severe asthma are more likely to have airway obstruction even after maximal treatment. The results suggest that those who suffer severe asthma have a different form of the disease.

“SARP was formed to look for an underlying cause of severe asthma, because it is not responding to treatment,” said Ronald Sorkness, a physiologist at the University of Wisconsin in Madison and the lead author of the study, “Lung Function in Adults with Stable but Severe asthma: Air Trapping and Incomplete Reversal of Obstruction with Bronchodilation.” Understanding the pathophysiology of severe asthma and improving its treatment is the goal of SARP.

The study, which appears online in the Journal of Applied Physiology, compared lung function measurements from 287 people with severe asthma and 382 people with mild and moderate (non-severe) forms of the disease.

Living with asthma

There is much that is still unknown about asthma. For example, it is not clear why more women than men have asthma, and why the reverse is true among children. SARP is an ongoing project that has collected data and examined various aspects of asthma, including the role that genes and viruses may play in its onset.

Most asthma cases, 90-95%, can be controlled with medication. But the remaining 5-10% are the people who suffer a severe form of the disease that doesn't respond well to treatment. People who have severe asthma are likely to have more attacks and are more at risk of a fatal attack.

During an asthmatic attack, the airways in the lung narrow and may even close. A person suffering an attack may experience chest tightness, cough, shortness of breath, and wheezing. The airways in the lung, which look something like a tree with many branches, become inflamed and may fill with mucus.

Allergies and infections may cause the inflammation of the airways, and asthmatic attacks are more likely to occur with a cold or during allergy season. Inhaled corticosteroids, which reduce airway inflammation, can reduce the frequency and severity of asthma attacks, and bronchodilators, which relax the muscles in the airways and allow them to open, can relieve asthma for most people. Although asthma mortality rates are low, an attack can cause suffocation and death. There are about 4,200 asthma deaths in the U.S. each year.

Not like the others?

If severe asthma is different from milder forms of the disease, and those differences can be identified, it might suggest new treatments. On the

other hand, if severe asthma is not different, only a more extreme version of the same disease, then using current treatments more aggressively might work.

Sorkness and his fellow SARP researchers used lung function data collected at 10 research centers that were part of SARP. He examined four aspects of lung function:

-- Air flow limitation. A longer period of time is required to exhale a volume of air. This is probably related to airway narrowing and is a hallmark of asthmatics, whether mild, moderate or severe.

-- Air trapping. An inability to exhale completely. Most people can exhale about 70% of their lung volume. Air trapping occurs when the exhalation is significantly less than that benchmark. This is related to extreme narrowing and complete closure of airways during an exhalation.

-- Reversibility. Most asthma, except for severe cases, is reversible with bronchodilator treatment.

-- Hyperresponsiveness. Irritants such as smoke can cause muscles in the airways to contract and close. Those who have asthma are much more sensitive, that is, hyperresponsive to these irritants.

The study found that air trapping was characteristic of those who suffered severe asthma, but not of those with non-severe asthma. Furthermore, as airflow limitation became more pronounced, there was more air trapping in the severe group, but not among those who suffered moderate or mild asthma.

Airflow limitation was common among asthma sufferers, regardless of whether they had mild, moderate or severe forms of the disease. But

there was little air trapping among the non-severe group, even when there was air flow limitation. Conversely, in the severe group, even when there was no airflow limitation, they had some degree of air trapping.

“That tells us that something different is going on in people classified as having severe asthma, either physiologically or in the airways that are affected,” Sorkness said. It’s likely that airflow limitation occurs in the larger airways of the lungs, while air trapping is occurring in the small airways that branch to the outer portions of the lung.

The researchers also found that those with severe asthma showed incomplete reversibility with bronchodilator treatment. That is, the severe group was more likely to have airway obstruction even after maximal treatment.

There was not much difference between severe asthmatics and non-severe asthmatics on the measure of hyperresponsiveness. However, the subjects with the most severe asthma were not included in the airway challenge portion of the study for fear of setting off a serious attack.

“Air trapping and non-reversibility were most important factors in defining the severe asthma group,” Sorkness said.

Source: American Physiological Society