

Mucus, cough and chronic lung disease: New discoveries

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As a cold ends, a severe mucus cough starts. Sound familiar? Two studies now give explanations: First, crucial mechanisms of the mucus in both diseased and healthy airways; second, what happens in such chronic lung diseases as cystic fibrosis and chronic obstructive pulmonary disease (COPD).

"This is new knowledge, but there are no instant cures to be found yet. But to make progress, it's important to understand how the mucus clearance works," says Gunnar C. Hansson, Professor of Medical Biochemistry at Sahlgrenska Academy, University of Gothenburg, Sweden.

The studies, published in *European Respiratory Journal* and *Journal of Clinical Investigation Insight*, describe how the normal [lung](#) is kept clean by long mucus bundles formed in glands, which are moved along the airways and thus "sweep" and clean the surface.

When particles or irritant substances are inhaled, they temporarily bring the mucus bundles to a halt. Meanwhile, the cilia collect the debris onto the bundles, and these are then efficiently cleared out

of the lungs when the bundles start moving again.

In a lung infection or chronic lung disease, the lung mucus is transformed into a virtually immobile mucus layer against which the cilia are powerless. This layer keeps bacteria away from the epithelial cells, thereby protecting them.

Both defensive and harmful

Toward the end of a cold, the mucus layer needs to be coughed up, which explains why a cold ends with mucus coughing. But in certain types of [chronic lung disease](#), such as cystic fibrosis or COPD, the mucus remains on the airway surface. There, although the mucus layer essentially has a protective role, it accumulates bacteria that will slowly damage the lungs.

The latest studies also show that in composition and function, the immobile mucus layer strikingly resembles the protective mucus [layer](#) in the large intestine. This, too, has been discovered and described by the Mucin Biology Group under Gunnar C. Hansson's leadership.

In the large intestine and lung alike, these mucus layers keep bacteria at bay minimizing contact with the body. The difference is that in the lung, the mucus tethering is transient and the mucus is cleared away once the infection is under control.

Paving the way for new treatments

One way of impeding the formation of a tethered [mucus layer](#) in chronic lung [disease](#) is to use a common medication, an inhalation spray (Atrovent), to keep the mucus bundles moving.

"Our observations explain some of the beneficial effects of this inhaled drug in the treatment of COPD," says Anna Ermund, a researcher in the group and first author of the article in *European Respiratory Journal*.

The scientists behind the studies believe that their findings on the important cleaning function of mucus, and on how tethered [mucus](#) damages the lung, will pave the way for new ways of treating both acute and [chronic lung diseases](#).

More information: Joan Antoni Fernández-Blanco et al. Attached stratified mucus separates bacteria from the epithelial cells in COPD lungs, *JCI Insight* (2018). [DOI: 10.1172/jci.insight.120994](https://doi.org/10.1172/jci.insight.120994)

Anna Ermund et al. The mucus bundles responsible for airway cleaning are retained in cystic fibrosis and by cholinergic stimulation, *European Respiratory Journal* (2018). [DOI: 10.1183/13993003.00457-2018](https://doi.org/10.1183/13993003.00457-2018)

Susan Birket. A clean sweep: mucin bundles clear the airway, *European Respiratory Journal* (2018). [DOI: 10.1183/13993003.01144-2018](https://doi.org/10.1183/13993003.01144-2018)

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