New blood test predicts 'late-phase' asthmatic response

Blood molecules called RNA transcripts may help scientists better understand the biology of allergic asthma.

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Keywords

gene expression profiling; biomarkers; asthma

What is this research about?

When people with mild allergic asthma are exposed to allergens in the environment, such as pollen or dust mites, they typically experience an immediate tightening (narrowing) of their airways, which makes breathing difficult.

About half of all people with asthma experience a second episode of airway narrowing hours after the first reaction. Symptoms of this second episode—called the "late-phase" asthmatic response—are usually more severe than symptoms of the initial reaction, producing mucus, inflammation (swelling) and even structural changes of the airways.

Scientists do not yet know why some people with asthma experience the late-phase response while others do not, but they have some ideas; factors such as asthma severity, allergen dose, and type of allergen exposure may all play a role.

To better understand this condition, the researchers explored whether biological clues to a late-phase asthma reaction can be detected in the blood. In this study, they set out to design a simple blood test that can be used to predict which individuals with asthma will develop a late-phase response.

What did the researchers do?

The researchers recruited 69 volunteers with mild allergic asthma and exposed each of them to a substance he or she was allergic to, such as cat allergen or house dust mites. The researchers measured each volunteer's lung function before this exposure and for up to seven hours afterwards.

Volunteers who experienced an initial asthmatic response only were classified as "early responders." Volunteers whose lung function dropped by more than 15% compared to their initial (baseline) lung function between three and seven hours after allergen exposure, were classified as "dual responders," meaning that these individuals experienced both the early and late-phase asthmatic response.

Each volunteer also provided a blood sample before and after allergen exposure.

The researchers then designed a blood test to look for differences in the blood of early versus dual responders. The test used a form of analysis called RNA-sequencing to measure molecules known as RNA transcripts in the blood.

What did the researchers find?

Using the blood test, the researchers identified a number of RNA transcripts that strongly predicted the late-phase asthmatic response. By applying the test to additional volunteers, the researchers confirmed that 14 of the identified RNA transcripts had a high predictive ability, and 13 of the 14 transcripts were less abundant at baseline among volunteers who developed the late-phase asthmatic response.

Some transcripts that best predicted the late-phase response are "unknown," in that they have not been previously described in the literature. The unknown transcripts represent new findings and researching them further may help scientists better understand the biological mechanisms involved in allergic asthma.

How can this research be used?

Although asthma is an airway disease, this research has shown that blood can be useful for predicting the late-phase asthmatic response.

Currently, lung function tests are the only reliable method of diagnosing a late-phase asthmatic responder. Further development of this simple blood test may eventually offer a low cost, non-invasive alternative to identifying late-phase asthmatic responders. This will facilitate the recruitment of appropriate subjects for clinical trials, which, in turn, may accelerate the development of new drugs for the condition.

Further research may also help to determine the specific role of the unknown RNA transcripts identified in this study. Since the unknown transcripts in the blood of individuals with allergic asthma were the most predictive of a late-phase response, understanding how they work will provide scientists with insights into how the late-phase asthmatic response develops. These insights, in turn, could contribute to the development of better treatments, management approaches and preventive strategies.