While resolving a key asthma challenge, researchers create new method to detect proteins in body fluids

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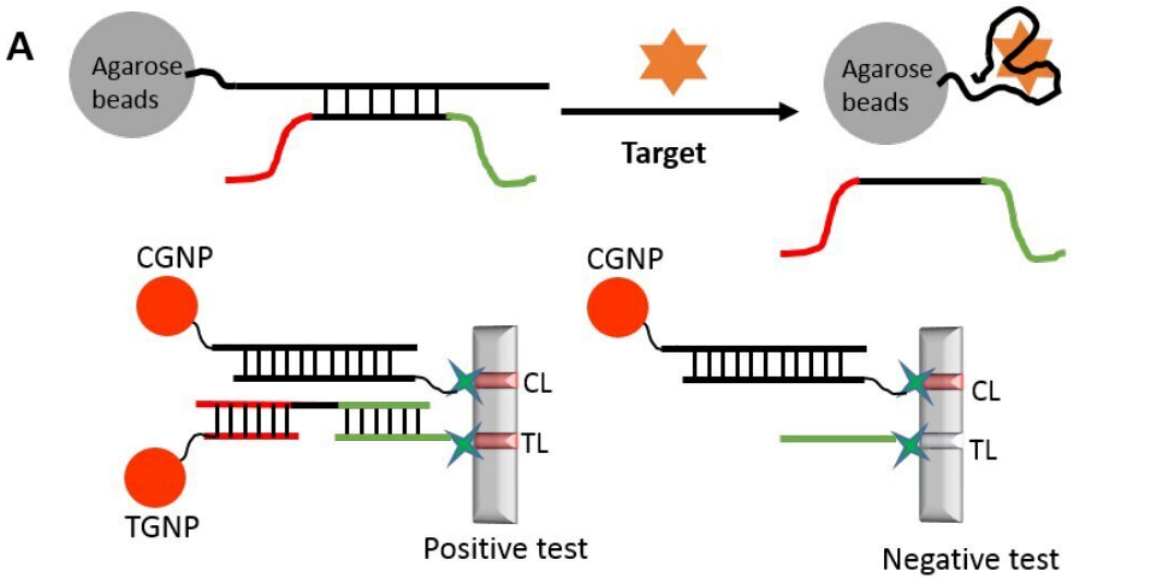

LFD based on EPX aptamer. A) Schematic illustration of structure switching construct and anticipated positive and negative tests in the presence and in absence of EPX. B) Sequences used to produce the aptamer-based LFD. C) LFD images obtained from positive and negative patient sputum samples without added SDS. NC: negative control (buffer alone), N6: EOS negative sputum sample, P5: EOS positive sputum sample. The negative sputum sample shows background on the test line. D) LFD images in the presence of SDS. N6: EOS

negative sputum sample, P5: EOS positive sputum sample showing lack of a test line. Credit: *Angewandte Chemie International Edition* (2023). DOI: 10.1002/anie.202307451

Based on decades of work to uncover the underlying mechanisms of asthma and other respiratory conditions, researchers at McMaster University and St. Joseph's Healthcare Hamilton have produced a simple, rapid test that can identify the presence of a key driver of severe asthma.

John Brennan, director of McMaster's Biointerfaces Institute, and Parameswaran Nair, a respirologist at the St. Joseph's-based Firestone Institute for Respiratory Health, led the creation of a new rapid test that can quickly and accurately identify white blood cells known as eosinophils, even when they are present in complex biological samples such as sputum, by tracking their protein signatures.

Having access to quick and reliable information about the presence of eosinophils can guide physicians in making important decisions about patient care.

The test looks similar to the familiar COVID-19 home test, which makes it readily adaptable to mass manufacturing once it is approved for clinical use.

To create the new test, the researchers developed and deployed a protein-targeting element known as a DNAzyme and modified it for use in the rapid test.

First isolated in 1994, DNAzymes have primarily been generated for detection of metals or bacterial targets. Until now, no one had succeeded in using DNAzymes to target specific protein markers in any context.

Now that the team has overcome this obstacle, Brennan believes the new test platform could be adapted to identify any material of biological origin by detecting its protein signature.

The rapid test is the outcome of more than a decade of collaboration between Brennan and Nair, which in turn was built on previous work at the institutions, dating back decades.

"This is what our collaboration set out to achieve," says Brennan, one two corresponding authors of a new paper in *Angewandte Chemie International Edition*. "This test and others like it can have the kind of lasting, meaningful impact that will improve or even save many lives."

"Previous research at the Firestone Institute, led by the late Professor Freddy Hargreave, had pioneered another technique to enumerate eosinophils in sputum to guide asthma treatment," says Professor Nair, who is a respiratory physician at St. Joe's and a Professor of Medicine at McMaster University. "However, this method is cumbersome and time-consuming, and therefore is not widely available to patients. This new approach is a huge advancement to make the technique more widely applicable."

Brennan and Nair's co-authors are Monsur Ali, Manali Mukherjee, Katherine Radford, Zil Patel and Fred Capretta. The researchers are planning a full clinical trial of the new test, which is the next critical step in bringing it to market.

A rapid test to detect eosinophilia would help clinicians make decisions about using drugs such as steroids or new biologics for patients with severe asthma and other lung diseases associated with eosinophilia, such as severe cough, and COPD, says Nair. It would also help to limit the unnecessary use of antibiotics.

More information: M. Monsur Ali et al, A Rapid Sputum-based Lateral Flow Assay for Airway Eosinophilia using an RNA-cleaving DNAzyme Selected for Eosinophil Peroxidase, *Angewandte Chemie International Edition* (2023). DOI: 10.1002/anie.202307451