Medical science

Breath test to reduce overprescribing of antibiotics

'Electronic nose' can tell difference between bacterial and viral illness within five minutes

UK research is expected to reduce the prescribing of antibiotics © Joe Raedle/Getty Images

Clive Cookson in Warwick SEPTEMBER 12, 2019

A UK-led research consortium has developed a new weapon in the fight against antimicrobial resistance — a breath test that can tell within five minutes whether a patient with a respiratory infection should be treated with antibiotics.

James Covington, professor of electronic engineering at the University of Warwick, released first results from a clinical trial of the "electronic nose" at the British Science Festival. He said the device, called BreathSpec, would cut overuse of antibiotics by making sure that doctors only prescribe them for infections caused by bacteria and avoid them when the patient has a viral illness such as flu or a cold.

Machines that detect organic molecules in the patient's breath are being used to diagnose a range of diseases including cancers and metabolic, immune and other disorders. But Prof Covington said BreathSpec, a £3m international project funded by the EU, was the first electronic nose designed to give a quick result at point of care, which doctors could use to distinguish bacterial from viral infections.

The trial involved 1,112 patients at hospitals and GP practices around the UK who had symptoms of respiratory tract infections and were candidates for antibiotic treatment. The portable BreathSpec machine — made for the project by Imspex, a UK diagnostic instruments

company — accurately identified 80 per cent of the patients with clinical symptoms who did not have a bacterial infection and 80 per cent of those who had flu or a common cold.

Subsequent analysis of samples from the patients, using standard microbiology, confirmed the breath test results. Just 278 patients with respiratory symptoms were infected with bacteria and 648 with viruses, while 186 had no infection.

Prof Covington said the researchers expected to improve the device's accuracy substantially as they analysed more data. A "traffic light system" might be developed, with green denoting confidence that there is no bacterial infection and red that bacteria are present, while yellow meant some uncertainty, allowing doctors to prescribe antibiotics at their discretion.

"This should be thought of as a screening test to help doctors not to prescribe," said Prof Covington. "Drug stewardship is one way to slow down the global problem of antimicrobial resistance. Breath analysis of colds and flu could play an important part in the solution."

Analysis of primary care prescribing in the UK shows that 46 per cent of all antibiotic prescriptions are for illnesses affecting the respiratory tract and ear, nose and throat, he said. Most of these drugs have no effect on the illness and serve only to drive the evolution of antibiotic resistance, because less than 10 per cent of respiratory tract infections seen by GPs are bacterial.

The artificial nose uses a combination of two analytical techniques — called gas chromatography and ion mobility spectrometry — to distinguish between organic molecules in the breath of people with different types of infection. These distinctive molecular signatures result from interactions between the bacteria or viruses and the patient's immune system.

"The instrument is ultra-sensitive and is portable and patient friendly," said Prof Covington. "At present the analysis time is about five minutes but we think we can get that down to 20 seconds while improving accuracy." He estimated that it would take three to six years to reach routine clinical practice, depending on regulatory approval.

The team may enter BreathSpec for Britain's still unclaimed £10m Longitude Prize, which "will reward researchers who develop a point-of-care diagnostic test that will conserve antibiotics for future generations".

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