

Breath test identifies bacteria's fingerprint

Scientists have identified the chemical "fingerprints" given off by specific bacteria when present in the lungs, potentially allowing for a quick and simple breath test to diagnose infections such as tuberculosis.

Publishing their study in the *Journal of Breath Research*, the researchers have successfully distinguished between different types of bacteria, as well as different strains of the same bacteria, in the lungs of mice by analyzing the volatile organic compounds (VOCs) present in exhaled breath.

It is hoped that a simple breath test could reduce the diagnosis time of lung infections from days and weeks to just minutes.

Co-author of the paper, Jane Hill, from the University of Vermont, says, "Traditional methods employed to diagnose bacterial infections of the lung require the collection of a sample that is then used to grow bacteria. The isolated colony of bacteria is then biochemically tested to classify it and to see how resistant it is to antibiotics.

"This whole process can take days for some of the common bacteria and even weeks for the causative agent for tuberculosis. Breath analysis would reduce the time-to-diagnosis to just minutes."

Clinicians see breath-testing as an attractive method for diagnosing disease due to its ease of use and non-invasiveness. Scientists have already investigated breath-based diagnostics for multiple cancers, asthma, and diabetes.

In this study, the researchers, from the University of Vermont, analyzed the VOCs given off by *Pseudomonas aeruginosa* and *Staphylococcus aureus*, both of which are common in acute and chronic lung infections.

They infected mice with the two bacteria and sampled their breath after 24 hours. The VOCs were analyzed using a technique called secondary electrospray ionization mass spectrometry (SESI-MS), which is capable of detecting VOCs down to parts per trillion.

They found a statistically significant difference between the breath profiles of the mice infected with the bacteria and the mice that were uninfected. The two different species of bacteria could also be distinguished to a statistically significant level, as could the two different strains of the *P. aeruginosa* that were used.

They hypothesise that bacteria in the lungs produce unique VOCs that are not found in regular human breath due to their differing metabolism.

"We have strong evidence that we can distinguish between bacterial infections of the lung in mice very effectively using the breathprint SESI-MS approach and I

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suspect that we will also be able to distinguish between bacterial, viral, and fungal infections of the lung.

"To that end, we are now collaborating with colleagues to sample patients in order to demonstrate the strengths, as well as limitations, of breath analysis more comprehensively," continues Hill.

Source: [Institute of Physics](#) [1]

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