

Cystic Fibrosis Research News

Title:

Targeted exhaled breath analysis for detection of *Pseudomonas aeruginosa* in cystic fibrosis patients

Lay Title:

Focusing on tiny compounds in exhaled breath, can they help detect bacteria in people with cystic fibrosis?

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What was your research question?

We wanted to study small compounds that are in exhaled breath (besides oxygen and nitrogen), specifically those exhaled by people with cystic fibrosis (pwCF), and see if any of these compounds have anything to do with bacterial lung infections.

Why is this important?

pwCF get lung infections more easily than people without CF do. To limit lung damage, it is very important to catch these infections as soon as possible. Currently, we ask people to cough up sputum (mucus from the lungs) and check that for the presence of bacteria. However, this can be hard for someone to do, especially for children. Sometimes this makes it even necessary to go down someone's throat with a tube to get a sample, which is not very pleasant (top half of the figure). It would be easier and pain free to check exhaled breath for gasses that are produced by bacteria (bottom half of the figure).

What did you do?

Looking for compounds in exhaled breath is like looking for a needle in a haystack. What we did was

1. investigate which compounds other researchers found which are linked to these bacteria;
2. asked 53 pwCF if we could collect their exhaled breath in a special plastic bag.
3. The breath in the bags was analysed in our lab, after which we had a long list of compounds, our own haystack. We looked for the compounds found by other researchers and checked if these compounds were present more or less often in pwCF who had a lung infection due to the bacterium *Pseudomonas aeruginosa*

What did you find?

After our search for known compounds, we found 56 compounds of interest, of which we found 13 in our own haystack (the plastic bags with exhaled breath of 53 pwCF). We looked into adults and children separately. We found that children with an infection with *Pseudomonas aeruginosa* exhaled significantly less of a compound called ethyl acetate. This compound could predict an infection in 87% of the cases. In adults, it was a bit more complicated and we created a model of three different compounds that together predict a lung infection with an 86% accuracy.

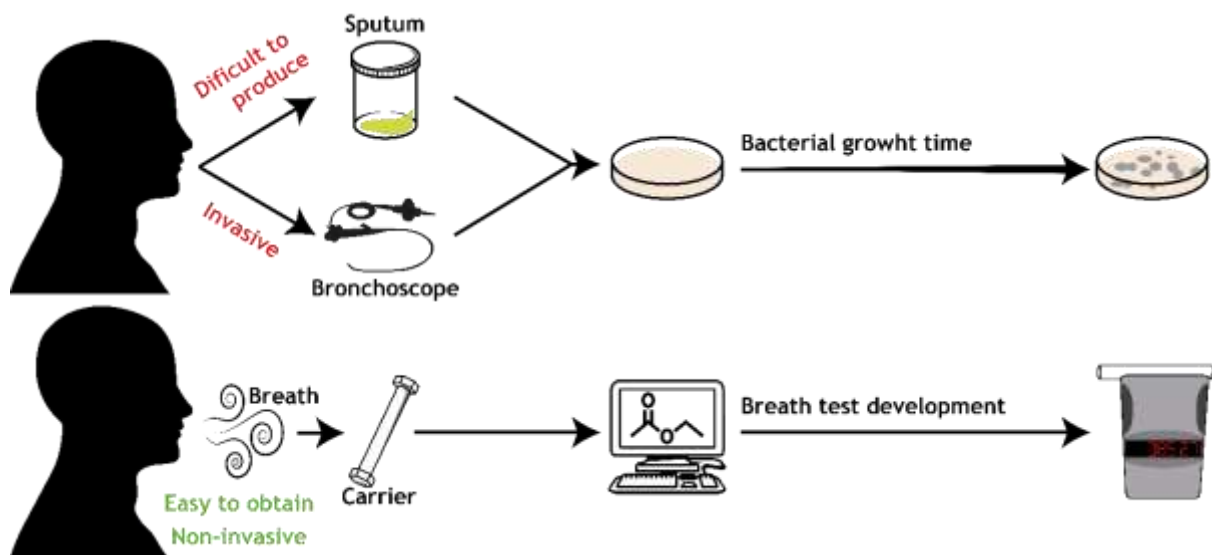
What does this mean and reasons for caution?

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These findings mean that exhaled breath contains compounds that could possibly help us diagnose bacterial infections in the future. Their accuracy is not 100%, but it could be used as an easy and pain free screening tool. More research is necessary. We have to test it on more people and try to find how early on we can catch a bacterial lung infection with *Pseudomonas aeruginosa*.

What's next?

We hope that in the future we can create a small device, similar to a breathalyser that cops use to detect alcohol, to detect bacterial lung infections. This might even be something patients can have at home, so they can check by themselves if they need to see a doctor.



Original manuscript citation in PubMed

<https://pubmed.ncbi.nlm.nih.gov/34016557/>