European Cystic Fibrosis Society

Journal of Cystic Fibrosis
The Official Journal of the European Cystic Fibrosis Society

Cystic Fibrosis Research News

Title:
The lung microbiota in children with cystic fibrosis captured by induced sputum sampling

Lay Title:
Using safe sampling and DNA tests to diagnose lung infections in children with cystic fibrosis

Authors:
Rebecca Weiser[1], Juliette Oakley[2,3], Katherine Ronchetti[2,4], Jo-Dee Tame[2,4], Sven Hoehn[5], Tomasz P. Jurkowski[5], Eshwar Mahenthiralingam[1], Julian T. Forton[2,3]

Affiliations:
[1]Microbiomes, Microbes and Informatics Group, Organisms and Environment Division, School of Biosciences, Cardiff University, Sir Martin Evans Building, Park Place, Cardiff, UK
[2]Department of Paediatric Respiratory Medicine, Noah's Ark Children's Hospital for Wales, Cardiff, UK
[3]School of Medicine, Cardiff University, UK
[4]Department of Paediatric Physiotherapy, Noah's Ark Children's Hospital for Wales, Cardiff, UK
[5]Molecular Biosciences Division, School of Biosciences, Cardiff University, Sir Martin Evans Building, Park Place, Cardiff, UK

What was your research question?
To improve the diagnosis of lung infection in children with cystic fibrosis we need better routine sampling methods for children who can't easily cough up sputum. We wanted to determine how two different sampling techniques (induced sputum and bronchoalveolar lavage lung washout) compared for detecting lung infections.

Why is this important?
Diagnosis of lung infection in children with cystic fibrosis is routinely performed using cough or throat swabs. These are easy to do but do not sample deep into the lung and are known to be inaccurate. A bronchoscopy (when a thin, flexible tube with a light and a lens or small video camera on the end is used to look into the lungs) and bronchoalveolar lavage is currently the best procedure for diagnosing infection, but it is invasive and requires children to have an anaesthetic. Induced sputum sampling is a safe, non-invasive and easily repeatable sampling method but at the moment we don't know much about how it compares to bronchoalveolar lavage in terms of detecting infection; our study aimed to investigate this.

European Cystic Fibrosis Society

Journal of Cystic Fibrosis
The Official Journal of the European Cystic Fibrosis Society

Cystic Fibrosis Research News

What did you do?
We collected bronchoalveolar lavage samples and induced sputum samples from 30 children with cystic fibrosis. Up to three bronchoalveolar lavage samples were collected for each child, and each sample came from a different part of the lung. Only one induced sputum sample was collected for each child. We used highly accurate DNA-based tests to determine all of the microorganisms in the different sample types. Once we had identified the microorganisms, we compared the bronchoalveolar lavage and induced sputum samples to see if there were any differences in the infections that had been detected.

What did you find?
We found that each child had a unique lung infection profile. In almost 30% of children, we saw that bronchoalveolar lavage samples taken from different parts of the lung identified different microorganisms, indicating that infection is not always uniform across the lungs. The microorganisms detected in induced sputum samples closely matched one or more bronchoalveolar lavage samples in 50% of children, and identified the most common microorganisms in bronchoalveolar lavage samples in another 30%. Therefore, in the majority of children, induced sputum performed well at detecting the infections found deep in the lung by bronchoalveolar lavage.

What does this mean and reasons for caution?
The finding that infection is often not uniform across all areas of the lungs means that in certain cases it may be difficult to consistently diagnose infections, even when using a direct sampling method like bronchoalveolar lavage. Our study suggests that induced sputum sampling can diagnose the infections found deep in the lung most of the time. These results support the routine use of induced sputum alongside other sampling techniques to more accurately diagnose lung infections.

What's next?
As induced sputum is a safe and non-invasive sampling method, we are using it to collect multiple samples from children over time. We will apply the accurate, DNA-based tests for microorganisms to these induced sputum samples to understand how infection appears and changes as children with cystic fibrosis get older.

Original manuscript citation in PubMed
https://pubmed.ncbi.nlm.nih.gov/35078737/