

Cystic Fibrosis Research News

Title:

The cystic fibrosis gut as a potential source of multidrug resistant pathogens

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What was your research question?

Are people with CF more likely to carry antibiotic resistant bacteria in their gut?

Why is this important?

Strains of bacteria that are resistant to antibiotics are a growing public health problem, particularly those that are resistant to several different types of antibiotic. However, where these multidrug resistant bacteria come from isn't completely understood. Individuals with CF have amongst the highest exposure to antibiotics of any group of people and bacteria in their gut could become multidrug resistant. Understanding whether this is the case would help us to protect individuals more widely, such as family members, from difficult to treat infections. It will also help us understand which bacteria are sharing their multidrug resistance abilities with other bacteria.

What did you do?

We looked for antibiotic resistant bacteria in stool samples from adults with CF using two approaches: 1) culturing them in the laboratory and 2) sequencing their DNA directly to see what resistance gene they have. To do this, a DNA sequencing technique called shotgun metagenomic sequencing was used to identify all the antibiotic resistance genes present in any gut bacteria. We compared the resistant bacteria detected in CF stool samples with those present in adults without CF or recent antibiotic exposure. In addition, we used culture to target two bacterial species that commonly cause serious infections - *Escherichia coli* and *Klebsiella pneumoniae* - and measured their resistance to aminoglycosides, a type of antibiotics commonly used in CF care.



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What did you find?

We found that people with CF had a higher number of bacterial genes for aminoglycoside resistance in their stool samples compared to non-CF samples. We also discovered these resistance genes were in plasmids, bits of DNA that can move between bacteria for other types of antibiotic. We were able to show this using both culture methods (that are routinely used by pathology services) as well as sequencing methods (which uses cutting-edge technologies). We also found a higher number of multiresistant *E. coli* and *K. pneumoniae* in CF stool samples versus non-CF samples.

What does this mean and reasons for caution?

Antibiotics are crucial for CF care and need to be taken as prescribed. Our findings show that, as a side-effect of the high level of antibiotics taken, persons with CF often carry many antibiotic-resistant bacteria in their stool. These bacteria are unlikely to cause serious infections in those with CF. However, it is important that we employ good hygiene practices to prevent them from spreading and causing difficult to treat infections in vulnerable individuals, such as the very young or very old.

What's next?

Our findings show the need to better understand how the antibiotics used in CF stool can increase the chance of multidrug resistant bacteria emerging, even where these treatments are being used for lung infections. Larger studies are now needed to support this and help us to better understand how to control their spread.

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