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Cystic Fibrosis Research News

Title:

Repurposing DNase I and alginate lyase to degrade the biofilm matrix of dual-species biofilms of *Staphylococcus aureus* and *Pseudomonas aeruginosa* grown in artificial sputum medium: in-vitro assessment of their activity in combination with broad-spectrum antibiotics

Lay title:

Repurposing enzymes to degrade complex biofilms containing two bacteria and improve antibiotic activity

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What was your research question?

Can we make antibiotics more effective against lung infections in cystic fibrosis by using enzymes to break down biofilms?

Why is this important?

For people with cystic fibrosis, lung infections are tough to treat. The infections are caused by bacteria that huddle together in a sticky, protective layer called a biofilm. If we can break this layer, antibiotics might have a better shot at getting rid of the infections.

What did you do?

We tested if an enzyme called DNase I, which is already used to thin mucus in cystic fibrosis, could help break down the biofilm in the lungs. We also checked if using this enzyme with others and combining them with antibiotics could tackle infections better, especially those caused by two common bacteria in cystic fibrosis, Staphylococcus aureus and Pseudomonas

aeruginosa. We grew these bacteria in a lab in conditions that mimic the mucus in cystic fibrosis, treated them with different enzyme and antibiotic combos, and then checked how much biofilm and bacteria were left. We also used microscopes to look at the biofilm's structure and measured how thick and sticky it was after treatment.

What did you find?

We discovered that the biofilms were almost completely wiped out when treated with a mix of enzymes (DNase I and alginase) and two different antibiotics. Under the microscope, we saw that the enzymes broke down the biofilm's DNA and sugar components, while the antibiotics killed off the bacteria. The enzymes made the biofilm less thick and sticky, making it easier for antibiotics to do their job. However, we needed to use a lot of enzymes to see these effects, more than what's typically safe to breathe in.

What does this mean and reasons for caution?

This study suggests that enzymes can help antibiotics fight biofilms in lung infections. But, because we had to use high levels of enzymes, we need to be careful and do more testing to make sure this method is safe for people.

What's next?

We plan to test other enzyme and drug combinations to find a way to safely and effectively get rid of biofilms in conditions similar to what we'd see in patients.

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