



Investigating bacterial communication

A new approach to antibiotics?

Narrator

Cystic Fibrosis patients are prone to infection by *Pseudomonas aeruginosa*. This pathogen has the potential to cause fatal lung disease.

Andrea Hardman

This is a fresh sputum sample I collected earlier from a Cystic Fibrosis patient. And what I want to do is to find out if there are any quorum sensing signal molecules present within the sample. So here I have an agar plate, which contains bacteria, which will respond to any signal molecule which is present within the sample by producing light when we look at it under the light camera here."

What you're beginning to see in the middle, as the image accumulates, is where the sputum has been placed on top of the agar plate. So you can see there's obviously quite a lot of quorum sensing molecules present in the sample we've put on, cos we're getting quite a lot of activation on the plate.

Roger Finch

Pseudomonas aeruginosa is an organism that we have a very healthy respect for in medicine. Causes some very serious infections. Not only does it do that but it is also rather difficult to treat.

Paul Williams

It is naturally resistant to many of the antibiotics that would normally be used.

Roger Finch

We clearly are seeing signal molecule production in this organism, and through intervening with the expression of these signal molecules we would very much hope that we could at least control some aspects of disease.

Without quorum sensing, many standard bacterial infections could never take hold. The pathogens use signaling as a central part of their strategy.

Paul Williams

Because bacteria co-ordinate their attack to try to defeat the host defences, their Achilles' heel is that all of those are coordinated through the quorum sensing. If we hit the quorum sensing, we could then hit the organism

Narrator

The aim is to confuse the enemy bacteria and break their lines of communication. Even long after the invasion, the pathogens are deceived into sensing that their numbers are low. So low that the invaders never get the command to attack.

Barrie Bycroft

In essence, it's like turning a panther into a pussycat.

Paul Williams

By blocking quorum sensing you're not blowing up the bacteria. You're stopping them making their toxins, you're stopping them from growing, they can't get their food, and therefore you're going to see host defence systems dealing with them and clearing them out.

Barrie Bycroft

The ability to switch off the behavior which is responsible for disease is potentially very exciting.

Narrator

It could herald a completely different approach from conventional antibiotics.

Paul Williams

Now most antibiotics kill bacteria - like Domestos, 99% of bacteria are killed dead. Now if you killed 99% of them you may still have ten to the seven cells still alive.

Narrator

Even a single cell could be enough to generate mutations resistant to antibiotic. At present, pathogens are under enormous pressure to do just that.

Barrie Bycroft

There is unlikely to be the same selective pressures for resistance to blocking quorum sensing.

Roger Finch

We may be able to avoid the issue of antibiotic resistance. It won't affect other organisms that we carry, and those are the ones that often generate resistance when we use current broad-spectrum antibiotics.

Narrator

Doctors of the future may be empowered with very specific treatments. Drugs based on quorum sensing could target pathogens, leaving beneficial bacteria alone.

But none of this can happen fast.

Roger Finch

There's a long way to go, many years of hard research, but it's a new concept, it's exciting it's based on sound science and therefore it does need to be explored.

Paul Williams

And it would be wonderful to see some very basic research ending up in the clinic and being able to say yes, we've been able to see the fruits of our research come right through to actually helping people.