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Backstabbing Bacteria

Apparently, human society has more in common with a colony of bacteria than you might think. According to new research, one very familiar shared trait – the instinct to protect yourself and to hell with everyone else – could lead to new ways of treating killer infections. Jo Smith goes on the trail of the disingenuous germs who are threatening to bring their society to its knees.

Dr Steve Diggle spends his time at the University of Nottingham studying 'slime cities' of the kind that build up in the lungs of cystic fibrosis (CF) sufferers. These sticky biofilms, home to the bacterium *Pseudomonas aeruginosa*, are highly resistant to antibiotics and are the leading cause of death in CF patients, as well as a potential hospital bug. So just what is it about these slimy conurbations that we humans should recognise, and how can we use the similarities in our fight against the infections they cause?

Like most things going on in the living world, Darwinism turns out to be the underlying link, and understanding how bacteria communicate could be the key to exploiting it. In our society, information is everywhere: we are constantly absorbing messages from the media, our mobile phones and (heaven forbid) actual face-to-face conversation. Bacteria, too, are communication junkies, using chemical signals to convey information to each other by 'quorum sensing'. Through this process, individual cells coordinate their behaviour to act for the good of the entire population, so that the whole colony behaves rather like a single organism. Or so scientists previously assumed.



Pseudomonas bacteria: It might not look it, but there's heck of a lot of communication going on down there.

Like all communist societies, though, this bacterial utopia is vulnerable to sabotage by selfish individuals, out to gain all the benefits of cooperation without any of the effort. In a recent study published in the journal Nature, Diggle and his colleagues at the University of Edinburgh and the Institute of Infection, Immunity and Inflammation report the existence of 'cheater cells': bacteria that cheat the system either by ignoring the messages from their fellow citizens or not bothering to produce their own. "We can no longer consider bacteria to be single-celled entities living and dividing in isolation of each other. They can communicate with each other, preferentially direct aid towards close relatives and even cheat on each other," Diggle said. Sound like anyone you know?

As Diggle hints, such human-like behaviour goes deeper than simple indiscriminate cheating. The scum of bacterial society apparently still retain a spark of family feeling, as they do follow the rules when communicating with their closest relations. However, according to evolutionary theory, they probably have an ulterior motive: ensuring the indirect passage of their genes

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So there we have it: bacteria are selfish to the core. But in case you're tempted to follow their example, beware – Diggle is still on the case, and retribution could be on its way. "For bugs like *P. aeruginosa*, the idea of 'blocking' the cell-to-cell signals has been an attractive proposition for some time. This has become known as 'quorum quenching'," he explained. "In the laboratory we have successfully used enzymes to break down signals, which reduces toxin release," he said.

If Diggle and his team can continue to exploit this tendency of individual cells to play the game selectively for their own ends, then it may be possible to disrupt their communication system, ultimately sending their slime cities into meltdown.



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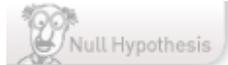
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