Medical Xpress

How bugs use cross-talk as their own computer memory to beat the system

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Cystitis and the other urinary tract infections suffered by one in five women may be caused by bacteria using a rudimentary form of computing power to co-ordinate their attacks and act as a genetic memory, according to scientists speaking today at the Society for General Microbiology's 159th meeting, in York.

"Like anything else, to survive and infect us, bacteria need to move about, protect themselves and engage with our cells", says Professor David Gally of the University of Edinburgh. "To do these actions they need to make things on their cell surface, just like we need hands, arms and legs to help us".

In any normal group of bacteria there will be a mixed population, some showing one cell surface factor at any one time, and some another. This increases the likelihood of the whole population surviving in a particular place, and since most of these surface factors trigger an attack by our defence cells, limits the danger of all the infectious bacteria being wiped out at the same time by our immune system.

The bacteria also don't want to make all the factors randomly, or have lots of different ones appearing on their surface at the same time, as they need enough to be effective for any particular task.

The Edinburgh researchers have discovered that the surface factors appear in clearly defined sequences and hierarchies, co-ordinated by a system called cross-talk, which also acts as a form of genetic computing

memory.

"By studying the cross-talk in cystitis-causing E. coli bacteria and a strain which causes the kidney disease pyelonephritis, we discovered how they co-ordinate their attacks to successfully cause infections in the normally sterile urinary tract. We also wanted to know why some infections are more serious than others, and why sometimes the infections fail to cause disease", says Professor Gally.

"We need to know whether the more dangerous infections can be predicted. Understanding how the cell surface factors are controlled by the bacteria should allow us to prevent them being switched on, or develop new treatments to disarm them, especially in antibiotic resistant strains", says Professor Gally.

The scientists discovered how different clusters of genes fight for dominance in the bacteria, and how this in turn drives the way the surface factors are made one after the other.

"Our family doctors currently write about 6 million antibiotic prescriptions a year to treat cystitis and urinary tract infections – and it's the same across Europe", says Professor David Gally. "Some people seem to clear the infection with antibiotics, but are later re-infected. This may be due to their behaviour, genetic factors or their particular anatomy. There are also environmental effects like frequent sexual intercourse. And a particular strain of bacteria may be good at sticking to cells, or invading urinary tract cells, thus avoiding being caught by the person's immune system or antibiotics".

Source: Society for General Microbiology