# Antibiotic resistance is a gut reaction

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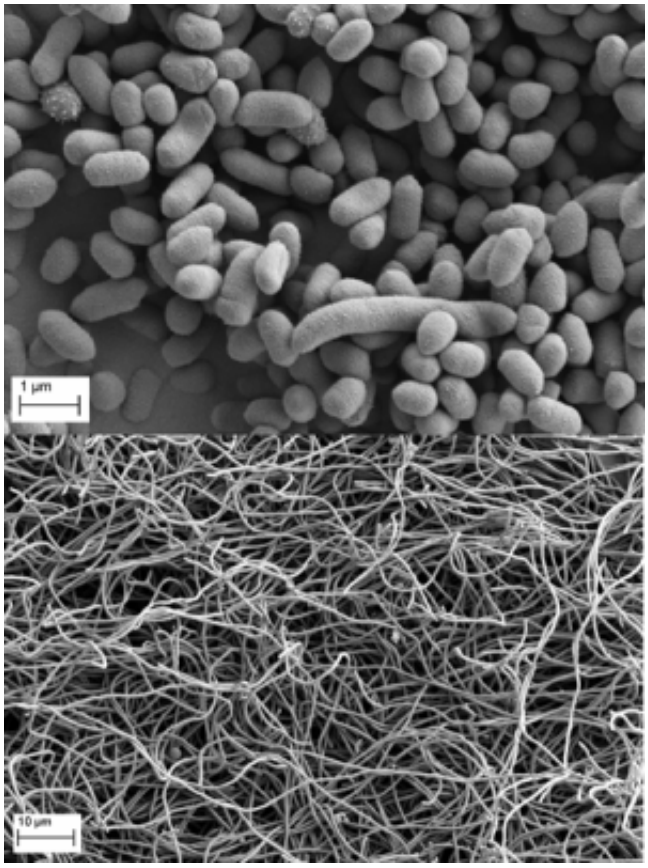


When treated with the antibiotic, the bacteria dramatically change shape, becoming filamentous. Credit: Louise Salt and Kathryn Cross

Scientists from the Institute of Food Research and the University of East Anglia have discovered how certain gut bacteria can protect themselves and others in the gut from antibiotics.

The bacteria produce compounds, called cephalosporinases, which inactivate and destroy certain antibiotics such as penicillin derivatives and cephalosporins, protecting themselves and other beneficial bacteria that live in close proximity. However, they may also give protection from these antibiotics to harmful bacteria, such as *Salmonella*.

The gut is home to hundreds of trillions of bacteria, which have important roles in maintaining our health. But a side effect of taking antibiotics is that these may also kill off some of our beneficial gut bacteria, allowing harmful bacteria to gain a foothold and cause an infection. Susceptibility to antibiotics isn't uniform in the hundreds of species that colonise our guts, and some of the most common bacteria, the Bacteroides, are among the most resistant.

By scanning the genome of strains of Bacteroides bacteria that live in the gut, the researchers found genes that produce an enzyme called cephalospoprinase, which specifically destroys certain antibiotics. They also showed that the cephalosporinases are exported out of the bacterial cells, attached to the surface of special packages called outer membrane vesicles (OMVs).

Bacteria use OMVs to distribute compounds made inside the bacterial cells to the outside world. Among these packaged compounds are cephalosporinases that can help protect any other bacteria that are in the same environment against antibiotics such as ampicillin. This was shown by adding the cephalosporinase-containing OMVs to cultures containing the ampicillin-susceptible gut bacteria, *Bifidobacteria breve*, which effectively protected them against high concentrations of antibiotics. A similar test showed that *Salmonella* bacteria were also protected.

The researchers at IFR, which is strategically funded by the Biotechnology and Biological Sciences Research Council, now want to see whether the protection against antibiotics from gut bacteria OMVs occurs in the gut itself. If so, this would have implications for how we use antibiotics. It will also improve our understanding of the growing problem of antibiotic resistant bacteria.

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