How antimicrobial resistance spreads inside the human gut

A collaboration between the Hudson Institute of Medical Research and the Wellcome Sanger Institute, Cambridge UK, explores how antimicrobial resistance (AMR) spreads inside the human gut.

Lead researcher Dr Samuel Forster said resistance occurs when bacteria acquire changes and no longer respond to antibiotics. This makes infections harder to treat and increases the risk of disease spread, severe illness and death.

"Antibiotic resistance is emerging at an alarming level, rendering some bacterial infections untreatable and increasing dependence on last line antibiotics," Dr Forster said.

"The gut microbiome contains thousands of beneficial bacterial species, each of which may carry antibiotic resistance genes and share these with disease-causing bacteria," he said. "This work provides a new tool in the toolkit for managing the emerging threat of antimicrobial resistance."

Dr Sam Forster in his lab at the Hudson Institute, where he studies antimicrobial resistance.

Bacteria can develop resistance either through changes in their genetic sequence or by acquiring resistance genes from other bacteria. But resistance in pathogens is just one side of the story — the beneficial bacteria in our microbiomes also need ways to protect themselves, otherwise they will be destroyed every time we take antibiotics.

Understanding the diversity of resistance in the microbiome and which ones can be spread to pathogens allows us to be prepared and take actions to prevent this occurring.

"Our research provides world-first experimental identification of the key mediators of this transfer from the microbiome to pathogens," said Dr Emily Gulliver, a postdoctoral researcher also working on the project.

"Of most concern, bacteria carrying these elements were also detected in other body sites including the vagina, skin and nasal cavity, with some also found across diverse environmental samples. This suggests how widespread these elements may be," Dr Gulliver said.

Dr Forster said, "In this case we are discovering the rules that allow bacteria to share key functions between them and using this knowledge to reduce and prevent potentially deadly infections."

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