Antibiotic resistance persists in bacteria, even absent selection pressure from antibiotics

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Plasmids are pieces of independent DNA that often carry multiple antibiotic resistance genes. Plasmids can jump from one bacterium to another, spreading that resistance. A team of French investigators now shows that bacteria that acquire plasmids containing resistance genes rarely lose them. The research is published in *Antimicrobial Agents and Chemotherapy*, a journal of the American Society for Microbiology.

In the study, the investigators focused on plasmids carrying resistance to extended spectrum cephalosporins. "Cephalosporins are antimicrobials that are critical to human health, as they are used to treat urinary tract, and other infections," said corresponding author Isabelle Kempf, D.V.M., head of the Mycoplasmology-Bacteriology Unit, the Agence Nationale de Securité Sanitaire, Université de Bretagne Loire, Ploufragan, France. The gene for resistance to extended spectrum cephalosporins is frequently carried on plasmids, often along with multiple genes for resistance to other antimicrobials.

The investigators inoculated pigs with an extended spectrum cephalosporin-resistant, non-pathogenic strain of *Escherichia coli*, and placed the pigs in pens with non-inoculated pigs. A plasmid in the *E. coli* carried the gene for extended spectrum cephalosporin resistance, as well as four other resistance genes. The investigators collected fecal samples from the pigs, at different time points following inoculation. From these, they grew 353 isolates of *E. coli*.

During the experiment, the pigs did not receive extended spectrum cephalosporin antibiotics. That meant that there was no selection pressure that might have favored the persistence of extended spectrum cephalosporin resistance in the bacterial populations. Nonetheless, all but three of the 353 isolates carried the resistance gene.

"Our results show that once a plasmid encoding resistance genes is transferred to a bacterial host, the probability that the bacteria will lose the encoded resistances is quite low, even absent a selective pressure," said Kempf

"Plasmids have developed sophisticated mechanisms to ensure their transmission to daughter cells during cell division," Kempf explained. "A better knowledge of these mechanisms and development of innovative tools to counteract them could result in new strategies to combat antimicrobial resistance."

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