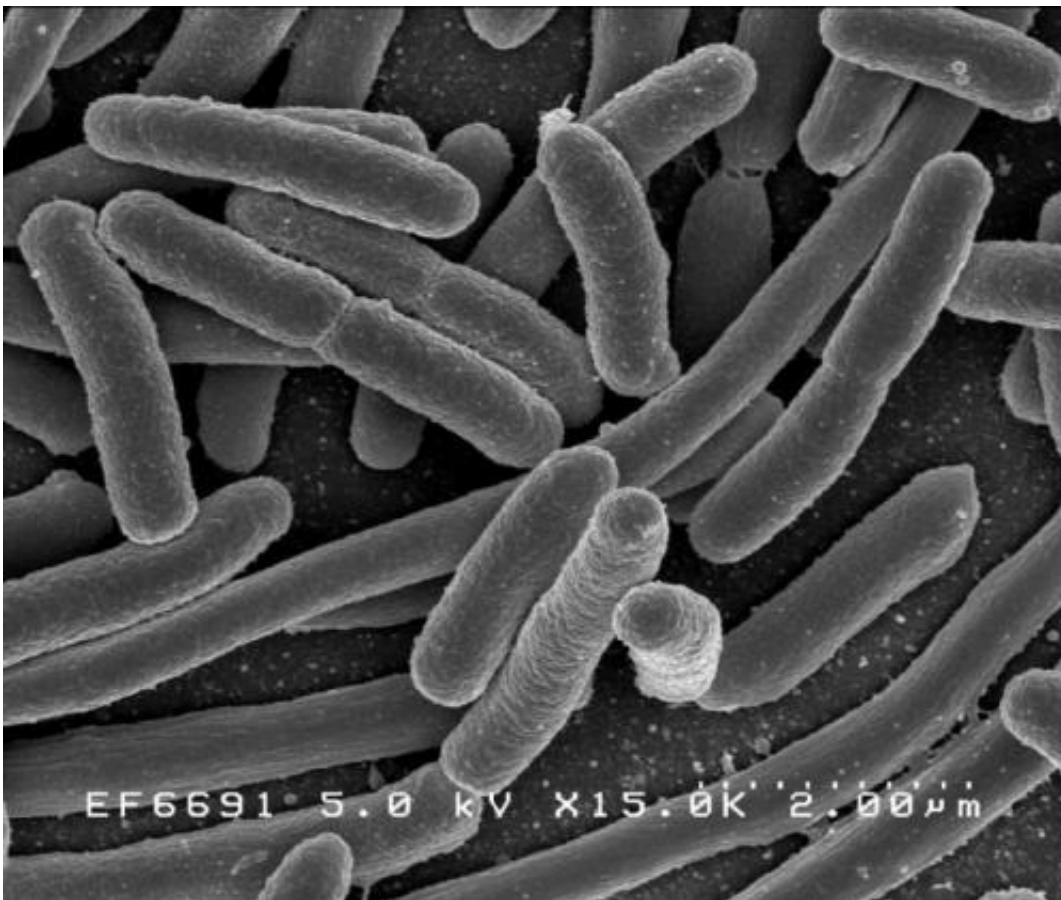


Multi-drug resistant strain of *E. coli* battles bacteria in healthy gut

October 17 2023



Escherichia coli. Credit: Rocky Mountain Laboratories, NIAID, NIH

Different strains of *E. coli* can outcompete one another to take over the gut, a new study reveals.

Publishing their findings in *PLOS Biology*, scientists reveal that a particular strain, known as MDR ST131, can readily colonize new hosts, even if those hosts already have *E. coli* in their healthy gut.

The international team, led by experts at the University of Birmingham, used a [mouse model](#) to help understand why strains of *E. coli* that live in a healthy gut are rapidly overtaken when challenged with a multi-drug resistant strain.

Lead author Professor Alan McNally, from the Institute of Microbiology and Infection at the University of Birmingham, commented, "Antibiotic resistance has been hailed as one of the biggest health problems of our time by the World Health Organization. There are further problems looming unless we get a better understanding of what is happening so that further drug resistance can be halted in its tracks.

"Scientists have long questioned what makes certain types of *E. coli* successful multi-drug resistant pathogens. It seems that extra-intestinal pathogenic *E. coli*, which cause [urinary tract](#) and [bloodstream infections](#), are particularly successful when it comes to developing resistance and are therefore especially tricky to treat. Our study provides evidence that certain types of *E. coli* are more prone to develop [antibiotic resistance](#) than others."

Most cases of *E. coli* infections are mild, but some strains can cause [severe symptoms](#) and even life-threatening complications. More severe infections are usually treated with antibiotics but the rise in multidrug resistance strains of *E. coli* is concerning. Multidrug-resistant strains are resistant to many different types of antibiotics, making them very difficult to treat.

Previous work shows that multi-drug resistance alone is not sufficient to drive strains to complete dominance. This most recent study

demonstrates that regardless of multi-drug resistant status, certain types of *E. coli* will outcompete others to live in the human gut.

The work was completed in parts. First, both multi-drug resistant and non-resistant gut-dwelling *E. coli* were found to easily colonize a mammalian gut. In a second part of the study, the multi-drug resistant strain was found to efficiently displace an already established gut-dwelling *E. coli* from the mouse [intestinal tract](#). The study provided further details to demonstrate that multidrug resistant lineages of extraintestinal *E. coli* have particular genetic differences that appear to give them a competitive advantage.

Successful strains of *E. coli* need to be able to spread between individuals or from the environment into individual hosts. The new study demonstrates that a particular strain, known as MDR ST131, can readily colonize new hosts, even if those hosts already have *E. coli* in their healthy gut.

E. coli are bacteria commonly found in the environment, foods and intestines of people and animals. There are many different types of *E. coli*. Although most strains of *E. coli* are harmless, others can cause illness, including diarrhea, [urinary tract infections](#), and often-fatal blood stream infections.

More information: Multi-drug resistant *E. coli* encoding high genetic diversity in carbohydrate metabolism genes displace commensal *E. coli* from the intestinal tract, *PLoS Biology* (2023).

Provided by University of Birmingham

Citation: Multi-drug resistant strain of *E. coli* battles bacteria in healthy gut (2023, October 17)

retrieved 29 April 2024 from

<https://phys.org/news/2023-10-multi-drug-resistant-strain-coli-bacteria.html>

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