

Researchers reveal what makes some bacteria life-threatening

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Credit: University of Queensland

Queensland researchers have discovered that a mutation allows some *E. coli* bacteria to cause severe disease in people while other bacteria are harmless, a finding that could help combat antibiotic resistance. The [findings](#) have been presented in *Nature Communications*

Professor Mark Schembri and Dr. Nhu Nguyen from The University of Queensland's Institute for Molecular Bioscience and Associate Professor Sumaira Hasnain from Mater Research found the mutation in the

cellulose making machinery of E. coli bacteria.

Professor Schembri said the mutation gives the affected E. coli bacteria the [green light](#) to spread further into the body and infect more organs, such as the liver, spleen and brain.

"Our discovery explains why some E. coli bacteria can cause life-threatening sepsis, neonatal meningitis and [urinary tract infections](#) (UTIs), while other E. coli bacteria can live in our bodies without causing harm," Professor Schembri said.

"The 'good' bacteria make cellulose and 'bad' bacteria can't."

Bacteria produce many substances on their cell surfaces that can stimulate or dampen the immune system of the host.

"The [mutations](#) we identified stopped the E. coli making the cell-surface carbohydrate cellulose and this led to increased inflammation in the intestinal tract of the host," Professor Schembri said.

"The result was a breakdown of the intestinal barrier, so the bacteria could spread through the body."

In models that replicate human disease, the team showed that the inability to produce cellulose made the bacteria more virulent, so it caused more severe disease, including [infection](#) of the brain in meningitis and the bladder in UTIs.

Associate Professor Hasnain said understanding how bacteria spread from intestinal reservoirs to the rest of the body was important in preventing infections.

"Our finding helps explain why certain types of E. coli become more

dangerous and provides an explanation for the emergence of different types of highly virulent and invasive bacteria," she said.

Professor Schembri said *E. coli* was the most dominant pathogen associated with bacterial antibiotic resistance.

"In 2019 alone, almost 5 million deaths worldwide were associated with bacterial [antibiotic resistance](#), with *E. coli* causing more than 800,000 of these deaths," he said.

"As the threat of superbugs that are resistant to all available antibiotics increases worldwide, finding new ways to prevent this infection pathway is critical to reduce the number of human infections."

The collaboration included teams from UQ's School of Biomedical Sciences led by Associate Professor Jana Vukovic and from Griffith University's School of Pharmacy and Medical Sciences led by Professor Glen Ulett.

More information: Nguyen Thi Khanh Nhu et al, A convergent evolutionary pathway attenuating cellulose production drives enhanced virulence of some bacteria, *Nature Communications* (2024). [DOI: 10.1038/s41467-024-45176-4](https://doi.org/10.1038/s41467-024-45176-4)

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