Scientists provide new insight on how bacteria share drug resistance genes

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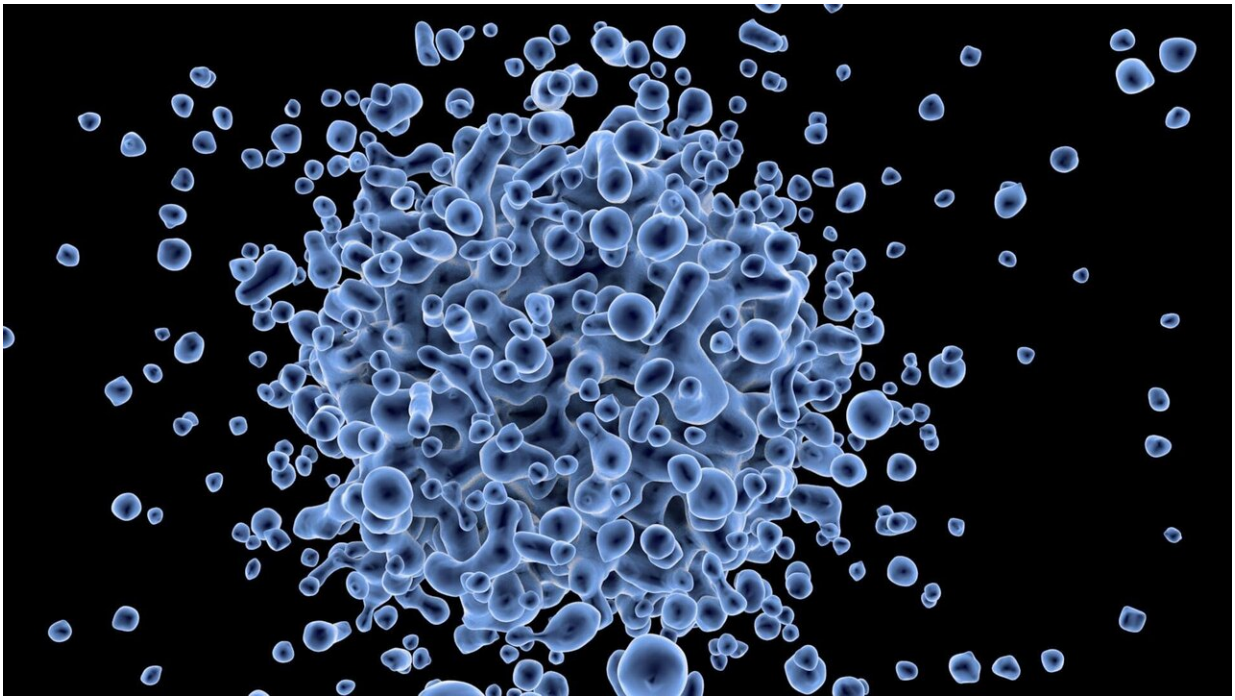

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Researchers have been able to identify and track the exchange of genes among bacteria that allow them to become resistant to drugs, according to a new study published today in *eLife*.

The findings add to our understanding of how this exchange of genetic material, also known as horizontal gene transfer, happens in bacteria that

cause infections in hospitals. They also highlight that while this transfer is likely to happen frequently, it is a complex process and challenging to study with current methods.

The horizontal gene transfer of mobile genetic elements allows otherwise harmless bacteria to hand off genes that provide resistance to antibiotics, turning them into drug-resistant 'superbugs'. This has led to significant problems in hospitals especially, where bacteria have harnessed the power of horizontal gene transfer to become resistant to both antibiotics and disinfectants, allowing them to cause severe infections in patients.

"The question of how to stop bacteria from exchanging drug resistance genes has challenged infectious disease researchers for decades," says first author Daniel Evans, Research Specialist in the Division of Infectious Diseases, University of Pittsburgh School of Medicine, Pittsburgh, US. "To tackle this challenge, we need to know where and how these genes are being shared in hospitals."

To investigate this, Evans and his team screened the genomes of more than 2,000 clinical bacterial isolates gathered from a single hospital over 18 months. The isolates were collected through the Enhanced Detection System for Hospital-Acquired Transmission project at the University of Pittsburgh.

Once the team had identified possible mobile genetic elements in the bacteria, they searched through the patient care data associated with the bacteria that had elements of interest to see whether horizontal transfer might have happened at the hospital.

Their results determined that many of the mobile elements found in the study were likely being shared among hospital bacteria. In one case, the team identified a plasmid—a circular piece of DNA found in bacterial cells—that encoded multidrug resistance and appeared to have been

horizontally transferred between bacteria infecting two separate patients.

"Our work shows how bacterial whole-genome sequence data, which is increasingly being generated in clinical settings, gives us the opportunity to study horizontal gene transfer between drug-resistant bacteria in hospitals," concludes senior author Daria Van Tyne, Assistant Professor of Medicine in the Division of Infectious Diseases, University of Pittsburgh School of Medicine. "We hope these findings, along with future studies, will be useful for designing new strategies to prevent and control multidrug-resistant bacterial infections in patients."

More information: Daniel R Evans et al, Systematic detection of horizontal gene transfer across genera among multidrug-resistant bacteria in a single hospital, *eLife* (2020). DOI: 10.7554/eLife.53886

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