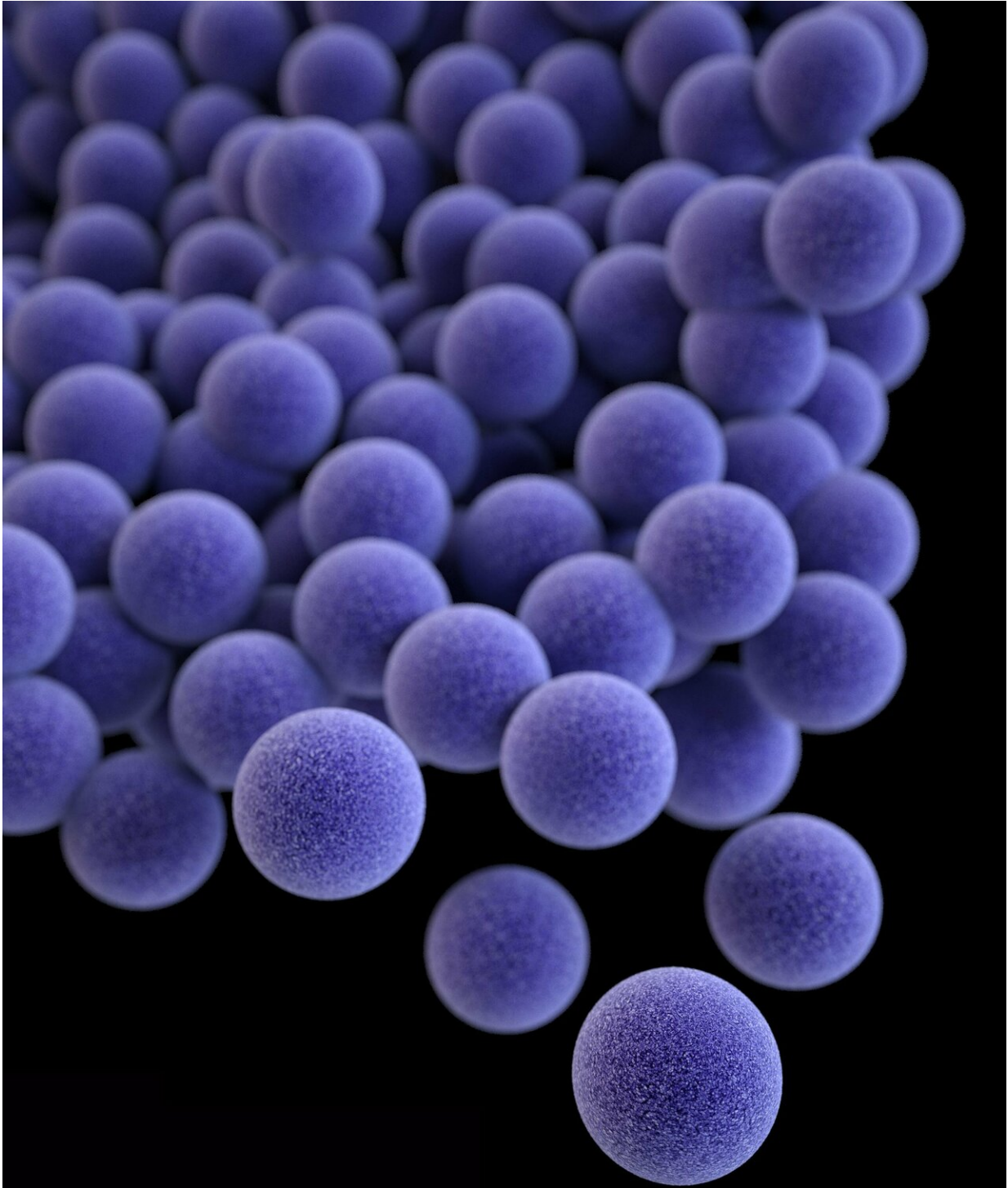


# Scientists discover genes that help harmful bacteria thwart treatment

February 8 2019

---



Methicillin-resistant *Staphylococcus aureus* (MRSA). Credit: U.S. Centers for Disease Control and Prevention

A Rutgers-led team has discovered two genes that make some strains of harmful *Staphylococcus* bacteria resistant to treatment by copper, a potent and frequently used antibacterial agent.

The discovery shows that *Staphylococcus aureus* can acquire additional [genes](#) that promote infections and antibacterial resistance and may open new paths for the development of antibacterial drugs, according to a study in the *Journal of Biological Chemistry*.

Researchers at Rutgers University-New Brunswick found the two genes in some strains of *S. aureus* bacteria. The genes protect the germs from copper, which is increasingly used in the global fight against severe infections.

The *Staphylococcus aureus* bacterium—a leading cause of serious and life-threatening infections in the United States—is highly resistant to antibiotics. Some strains of *S. aureus* have newly acquired genes embedded in their genome in pieces of DNA called transposons. DNA can be transferred from one organism to another, and transposons help the acquired DNA rapidly become a permanent part of the recipient's chromosome.

Transposons aid in the spread of genes that can give rise to bacteria that are resistant to antibiotics and more likely to cause disease. The newly discovered genes are encoded within a transposon.

This process likely contributed to the recent North American epidemic of staph infections, according to Jeffrey M. Boyd, study senior author and associate professor in the Department of Biochemistry and Microbiology in Rutgers' School of Environmental and Biological Sciences.

Copper has been used for thousands of years to sterilize wounds and

drinking water, and hospitals recently began using it against bacteria found on medical instruments and other surfaces. But the two newly discovered genes, named *copB* and *copL*, encode proteins that help remove copper from *S. aureus* cells and prevent it from entering.

The genes may promote the survival of *S. aureus* in settings, such as in hospitals, that could lead to infections—and/or they may lead to *S. aureus* strains with higher copper resistance.

*S. aureus* bacteria live on skin. They are a leading cause of serious and life-threatening infections partly because many strains of *S. aureus*, such as MRSA and VRSA, are highly resistant to antibiotics.

Rutgers scientists, in collaboration with scientists at the University of Buffalo, also revealed the 3-D structure of the *copL* protein in the *B. subtilis* bacterium, a relative of *S. aureus*, using nuclear magnetic resonance (NMR) methods. Those methods were also used to identify the area where [copper](#) binds to the surface of the protein.

"This structure provides the basis for rational drug design and could lead to a novel path for antibacterial drug discovery," said co-author Gaetano T. Montelione, Jerome and Lorraine Aresty Chair and a Distinguished Professor in the Department of Molecular Biology and Biochemistry in the School of Arts and Sciences. He is also affiliated with the Center for Advanced Biotechnology and Medicine.

**More information:** Zuelay Rosario-Cruz et al, The *copBL* operon protects *Staphylococcus aureus* from copper toxicity: CopL is an extracellular membrane-associated copper-binding protein, *Journal of Biological Chemistry* (2019). [DOI: 10.1074/jbc.RA118.004723](https://doi.org/10.1074/jbc.RA118.004723)

Provided by Rutgers University

Citation: Scientists discover genes that help harmful bacteria thwart treatment (2019, February 8)  
retrieved 18 April 2024 from

<https://phys.org/news/2019-02-scientists-genes-bacteria-thwart-treatment.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.