Silver nanoparticles show promise in fighting antibiotic-resistant bacteria

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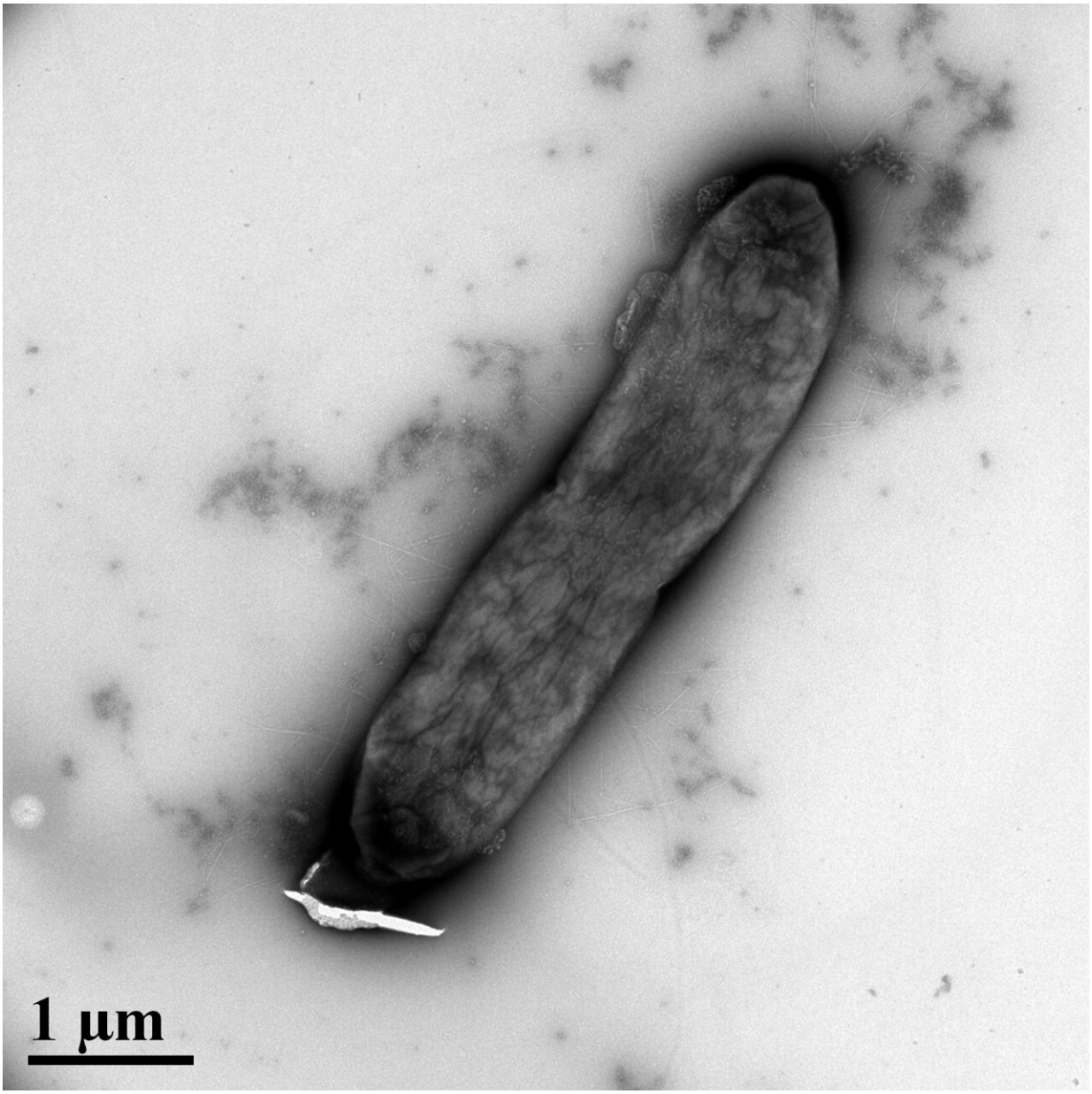

New research investigated whether silver nanoparticles could amplify the effects of antibiotics on antibiotic-resistant bacteria. Credit: Garrett Ellward

In a new study, scientists with the University of Florida have found that a combination of silver nanoparticles and antibiotics is effective against antibiotic-resistant bacteria.

The researchers hope to turn this discovery into viable treatment for some types of antibiotic-resistant infections. Antibiotic-resistant infections kill more than a million people globally each year.

For centuries, silver has been known to have antimicrobial properties. However, silver nanoparticles—microscopic spheres of silver small enough to operate at the cellular level—represent a new frontier in using the precious metal to fight bacteria.

In this study, the research team tested whether commercially available silver nanoparticles boost the power of antibiotics and enable these drugs to counter the very bacteria that have evolved to withstand them.

"We found that the silver nanoparticles and a common class of broad-spectrum antibiotics called aminoglycosides work together synergistically," said Daniel Czyż, senior author of the study and an assistant professor in the UF/IFAS department of microbiology and cell science.

"When combined with a small amount of silver nanoparticles, the amount of antibiotic needed to inhibit the bacteria decreased 22-fold, which tells us that the nanoparticles make the drug much more potent," Czyż explained. "In addition, aminoglycosides can have negative side effects, so using silver nanoparticles could allow for a lower dose of

antibiotic, reducing those side effects."

The findings were both surprising and exciting, said Autumn Dove, first author of the study and a doctoral candidate studying microbiology and cell science in the UF/IFAS College of Agricultural and Life Sciences.

"When I first saw the result, my first thoughts were, 'Wow, this works,'" said Dove.

Over the last several decades, overuse of antibiotics had led to the emergence of antibiotic-resistant bacteria and a decline in the effectiveness of traditional antibiotic drugs, the researchers said. The study's findings indicate that silver nanoparticles have the potential to renew the effectiveness of some of these drugs.

"Let's say you get a bad burn on your hand, and it gets infected with one of these resistant strains of bacteria," Dove said. "It's possible that dressing that burn with a combination of silver nanoparticles and antibiotics could both clear that infection and prevent those resistant bacteria from spreading elsewhere."

Though antibiotics mainly target bacteria, they can also damage human and animal cells. Using a microscopic worm called C. elegans, the researchers confirmed that the silver nanoparticles did not also make the antibiotic more toxic to non-bacterial cells.

Building on the study's promising findings, the scientists next plan to seek FDA authorization for clinical trials and work with UF Innovate to patent an antimicrobial product that uses silver nanoparticles.

More information: Autumn S. Dove et al, Silver nanoparticles enhance the efficacy of aminoglycosides against antibiotic-resistant bacteria, *Frontiers in Microbiology* (2023). DOI:

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