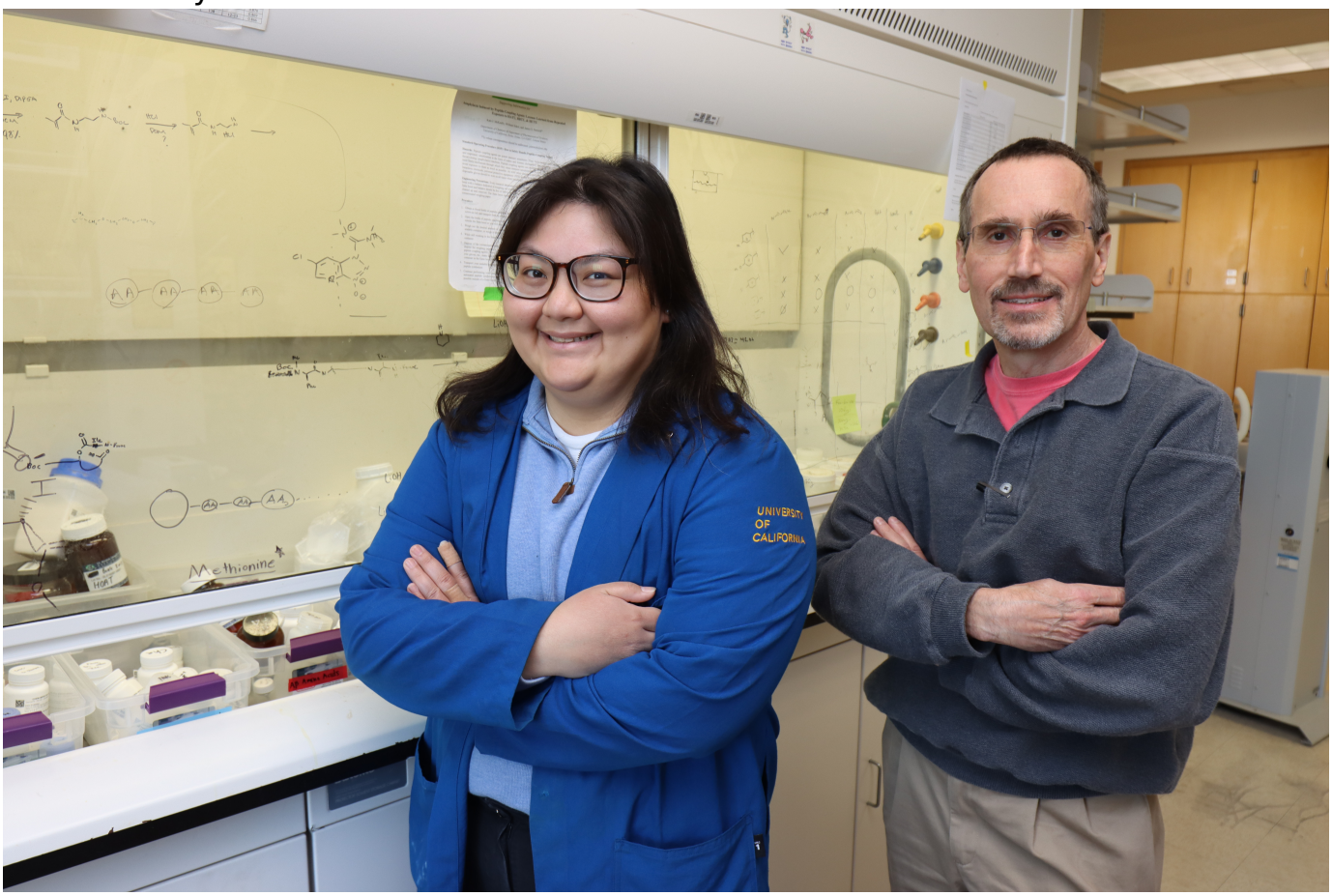
UC Irvine scientists invent new drug candidates to treat antibiotic-resistant bacteria

The new family of antibiotics may one day help save thousands of lives each year.
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UC Irvine Physical Sciences Communications



Ph.D. candidate Sophia Padilla and Professor James Nowick of the UC Irvine Department of Chemistry are helping redefine how doctors treat lethal bacterial infections.

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Lucas Van Wyk Joel / UC Irvine

Irvine, Calif., Feb. 24, 2025 — There's an arms race in medicine – scientists design drugs to treat lethal bacterial infections, but bacteria can evolve defenses to those drugs, sending the researchers back to square one. In the *Journal of the American Chemical Society*, a University of California, Irvine-led team describes the development of a drug candidate that can stop bacteria before they have a chance to cause harm.

"The issue with antibiotics is this crisis of antibiotic resistance," said Sophia Padilla, a Ph.D. candidate in chemistry and lead author of the new study. "When it comes to antibiotics, bacteria can evolve defenses against them – they're becoming stronger and always getting better at protecting themselves."

About 35,000 people in the U.S. die each year from antibiotic-resistant bacterial infections from pathogens like *Staphylococcus*, while about 2.8 million people suffer from bacteria-related illnesses.

"It's a big problem," said James Nowick, a Distinguished Professor of chemistry at UC Irvine who co-led the study.

The team designed a new family of antibiotics that's a variation of an existing drug called vancomycin, which is used as a last resort for extremely ill patients. The new version of vancomycin targets, bonds to and renders inactive two different parts of a molecule on the surfaces of pathogenic bacteria.

Nowick likens the process to grabbing the bacteria with both hands and subduing it. "What's happening at the molecular level is there are two pieces that can be targeted and that can be grabbed on to," he said.

This new version of vancomycin could be a giant leap forward. By binding molecules that bacteria need to build a protective cell wall, the drug may help end the antibiotic-bacteria arms race and eliminate the need for researchers to continuously design new drugs to treat newly evolved strains of antibiotic-resistant bacteria.

Padilla explained that the arms race is an ongoing and expensive endeavor. "It doesn't really solve the problem," Padilla said. "In terms of antibiotic development, I believe we shouldn't focus solely on modifying what we already know works, but rather take a step back and adopt a new approach."

Padilla and Nowick hope their new family of antibiotics inspires other researchers to explore similar approaches for treating antibiotic-resistant pathogens in non-traditional ways.

“What’s a new way that we can develop an antibiotic that doesn’t require us to keep doing the same thing over and over again?” said Padilla. “I think with our approach, and the approach of several others, we’re starting to target something that bacteria will most likely not evolve resistance to.”

UC Irvine’s Brilliant Future campaign: Publicly launched on Oct. 4, 2019, the Brilliant Future campaign aims to raise awareness and support for the university. By engaging 75,000 alumni and garnering $2 billion in philanthropic investment, UC Irvine seeks to reach new heights of excellence in student success, health and wellness, research and more. The School of Physical Sciences plays a vital role in the campaign’s success. Learn more at https://brilliantfuture.uci.edu/uci-school-of-physical-sciences/.

About the University of California, Irvine: Founded in 1965, UC Irvine is a member of the prestigious Association of American Universities and is ranked among the nation’s top 10 public universities by *U.S. News & World Report*. The campus has produced five Nobel laureates and is known for its academic achievement, premier research, innovation and anteater mascot. Led by Chancellor Howard Gillman, UC Irvine has more than 36,000 students and offers 224 degree programs. It’s located in one of the world’s safest and most economically vibrant communities and is Orange County’s second-largest employer, contributing $7 billion annually to the local economy and $8 billion statewide. For more on UCI, visit www.uci.edu.

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