Supercharged antibiotics could turn tide against superbugs

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Dr Mark Blaskovich. The number of patients dying from vancomycin-resistant bacteria prompted his team to look at revitalising old antibiotics. Credit: University of Queensland

An old drug supercharged by University of Queensland researchers has emerged as a new antibiotic that could destroy some of the world's most dangerous superbugs.

The supercharge technique , led by Dr. Mark Blaskovich and Professor Matt Cooper from UQ's Institute for Molecular Bioscience (IMB), potentially could revitalise other antibiotics.

Antibiotic-resistant bacteria – superbugs – cause 700,000 deaths worldwide each year, and a UK government review has predicted this could rise to 10 million by 2050.

Dr. Blaskovich said the old drug, vancomycin, was still widely used to treat extremely dangerous bacterial infections, but bacteria were becoming increasingly resistant to it.

"The rise of vancomycin-resistant bacteria, and the number of patients dying from resistant infections that cannot be successfully treated, stimulated our team to look at ways to revitalise old antibiotics," Dr. Blaskovich said.

"We did this by modifying vancomycin's membrane-binding properties to selectively bind to bacterial membranes rather than those of human cells, creating a series of supercharged vancomycin derivatives called vancapticins."

The rebooted vancomycin has the potential to treat methicillin-resistant Staphylococcus aureus (MRSA) and vancomycin-resistant Enterococci (VRE).

Professor Cooper said pharmaceutical companies had departed the antibiotic discovery field because new antibiotics were difficult to find and were not as lucrative as cholesterol-lowering medications or cancer treatments.

"Hence many scientists are re-engineering existing drugs to overcome bacterial resistance, rather than searching for new drugs," he said.

"Drug development is normally focused on improving binding to a biological target, and rarely focuses on assessing membrane-binding properties.

"This approach worked with the vancapticins, and the question now is whether it can be used to revitalise other antibiotics that have lost effectiveness against resistant bacteria.

"Given the alarming rise of multi-drug resistant bacteria and the length of time it takes to develop a new antibiotic, we need to look at any solution that could fix the antibiotic drug discovery pipeline now," Professor Cooper said.

More information: Mark A. T. Blaskovich et al. Protein-inspired antibiotics active against vancomycin- and daptomycin-resistant bacteria, *Nature Communications* (2017). DOI: 10.1038/s41467-017-02123-w

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