

Ancient natural history of antibiotic production and resistance revealed

August 13 2019



Glycopeptide antibiotic producers from the Wright study. Credit: McMaster University

A study from McMaster University has unearthed new details about the evolutionary history of both antibiotic production and resistance and



dates their co-emergence as far back as 350 to 500 million years.

The study is the first to put antibiotic biosynthesis and resistance into an evolutionary context. The findings will help to guide the future discovery of new <u>antibiotics</u> and antibiotic alternatives which are medicines that are vitally needed given the current global threat of antimicrobial resistance.

The study was published in Nature Microbiology.

"Our findings are of significant interest," said Gerry Wright, senior author and professor of the Department of Biochemistry and Biomedical Sciences at McMaster. He is also director of the Michael G. DeGroote Institute for Infectious Disease Research and the newly established David Braley Centre for Antibiotic Discovery.

"Our study reveals several implications in how we could potentially manage <u>antibiotic use</u> and find new drugs for antimicrobial infections."

The team extracted this history by first identifying the genome sequences encoding all of the necessary genetic programs for the production of glycopeptide antibiotics within a group of <u>bacteria</u> called Actinobacteria. Glycopeptides include vancomycin and teicoplanin, <u>essential medicines</u> for treating bacterial infections.

Researchers then plotted the changes in these genetic programs over time, revealing that while the precursors for genes responsible for antibiotic production date back to over one billion years, resistance is contemporary with the production of the first ancestors of vancomycinlike drugs, dating back to 350 to 500 million years.

"The results we uncovered in this study offers a valuable lens through which to consider the current antibiotic crisis," said Nicholas



Waglechner, first author and Ph.D. candidate in the Gerry Wright lab. "These compounds have been useful to bacteria on the planet even before dinosaurs appeared, and resistance co-evolved with production as a means of self-protection for producing bacteria. The use of vancomycin in <u>modern times</u> in medicine and agriculture has resulted in the movement of resistance from these innocuous producers to diseasecausing bacteria over a few short decades."

More information: Nicholas Waglechner et al. Phylogenetic reconciliation reveals the natural history of glycopeptide antibiotic biosynthesis and resistance, *Nature Microbiology* (2019). <u>DOI:</u> 10.1038/s41564-019-0531-5

Provided by McMaster University

Citation: Ancient natural history of antibiotic production and resistance revealed (2019, August 13) retrieved 4 May 2024 from <u>https://phys.org/news/2019-08-ancient-natural-history-antibiotic-production.html</u>

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.