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Researchers identify protein capable of neutralizing antibiotic-resistant bacterial cells

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Antibiotic-resistant infections are on the rise, foiling efforts to reduce death rates in developing countries where uncontrolled use of antibiotics and poor sanitation run amok. The epidemic of "superbugs," bacteria resistant to antibiotics, knows no borders—presenting a clear and present danger around the globe.

A groundbreaking discovery from Tel Aviv University researchers may strengthen efforts by the medical community to fight this looming superbug pandemic. By sequencing the DNA of bacteria resistant to viral

toxins, TAU researchers identified novel proteins capable of stymieing growth in treacherous antibiotic-resistant bacteria.

The research, published last month in *PNAS*, was led by Prof. Udi Qimron of the Department of Clinical Microbiology and Immunology at TAU's Sackler Faculty of Medicine and conducted primarily by TAU researcher Shahar Molshanski-Mor.

Fighting from within

"Because bacteria and bacterial viruses have co-evolved over billions of years, we suspected the viruses might contain precisely the weapons necessary to fight the bacteria," Prof. Qimron said. "So we systematically screened for such proteins in the bacterial viruses for over two and a half years."

Using high-throughput DNA sequencing, the researchers located mutations in bacterial genes that resisted the toxicity of growth inhibitors produced by bacterial viruses. In this way, the team identified a new small protein, growth inhibitor gene product (Gp) 0.6, which specifically targets and inhibits the activity of a protein essential to bacterial cells.

The inhibitor was found to cripple the activity of a protein vital to bacterial cells—a protein that maintains the bacterial cell structure. Malfunction of this bacterial protein consequently resulted in the rupture and consequent death of the bacterial cell.

Technology and collaboration

"The new technology and our new interdisciplinary collaboration, drawing from bioinformatics and molecular biology, promoted our study more than we could have anticipated," said Prof. Qimron. "We hope our

approach will be used to further identify new growth inhibitors and their targets across bacterial species and in higher organisms."

The researchers are continuing their study of bacterial viruses in the hope of identifying compounds and processes that facilitate improved treatment of antibiotic-resistant bacteria using yet uncharacterized bacterial viruses' proteins. They believe that further basic knowledge on bacterial viruses biology will eventually lead to unexpected breakthroughs in the fight against antibiotic-resistant bacteria.

Provided by Tel Aviv University