

Combating antibiotic resistant bacteria

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(PhysOrg.com) -- Researchers at Lawrence Livermore National Laboratory (LLNL) have discovered a new way to combat antibiotic resistant bacteria by using the bacteria's own genes.

For more than 50 years, antibiotics have been used to treat a variety of deadly infections and saved countless lives. Its broad introduction and application has changed the face of medicine worldwide.

Yet, despite the advances made to antibiotics over the years, the list of [antibiotic resistant bacteria](#), such as MRSA (Methicillin-resistant Staphylococcus aureus), E.coli, Salmonella and [Campylobacter](#), is growing and becoming one of the world's most serious health concerns. Infections once routinely treatable have now become more difficult to combat and potentially more lethal.

That's where Paul Jackson and his LLNL team come in. The group has taken a new approach to combating antibiotic resistant bacteria by developing a new generation of antibiotics, based upon a much deeper understanding of the bacteria's own genes. The method consists of turning the pathogens' own genes and processes against it.

"Rather than looking for a more traditional solution to the problem and perhaps finding a chemical or antimicrobial solution, we decided to harness genetic sequencing and take a closer look at the makeup of the pathogen's DNA," Jackson said. "In doing so, we've identified the genes within bacteria that encode for lytic proteins -- a very important component for cell survival and one that we could leverage against it."

Lytic proteins are used by bacteria to make small nicks at strategic points within the cell wall so the cell can synthesize new cell wall and divide.

With the lytic protein-producing genes identified, Jackson's team used the [genes](#) to drive synthesis of the encoded proteins in the laboratory and purified them. They then introduced the purified protein to the exterior of the bacterial cells. The results were quick and very clear -- complete and total destruction of the pathogen's cell wall. Because these lytic proteins are unique to each bacterial species, the purified protein will only target that specific bacteria cell species, leaving other cells unharmed.

"The purified protein has a very narrow spectrum but can be mixed with other lytic proteins from other bacterial species to produce a broader spectrum of antibiotics," Jackson said. "The research also has shown that the purified lytic protein is very stable, with a long shelf life and only extremely small amounts are required to very quickly destroy [bacterial cells](#)."

Because these proteins are essential to the life cycle of the cell, it is unlikely that the bacteria could adequately defend against it. If it tried, it would likely deprive the cell of the ability to divide -- a process absolutely required for production of more pathogen cells.

Jackson said his team can sequence genomes and produce purified lytic proteins within a few weeks for unknown bacteria species or species that have not been sequenced.

The team continues to test its pioneering technique on additional pathogens.

Provided by Lawrence Livermore National Laboratory

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