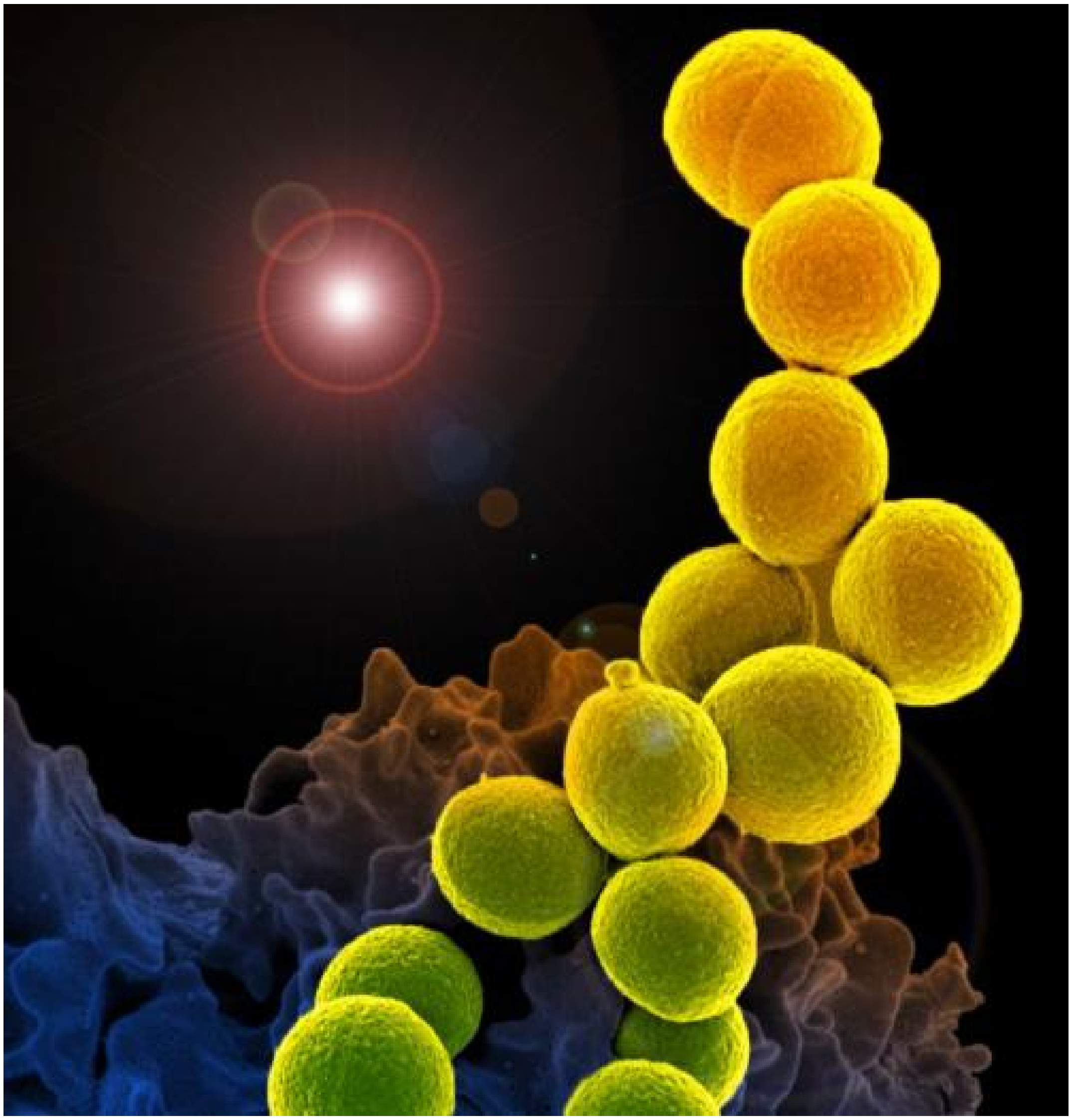
How bacteria survive antibiotic treatment

December 20 2016



In this electron micrograph, a white blood cell eats an antibiotic resistant bacteria called methicillin-resistant *Staphylococcus aureus*, or MRSA. Credit: National Institute of Allergy and Infectious Diseases

Scientists around the world are working hard to win the battle against multi-resistant bacteria. A new publication from the BASP Centre, University of Copenhagen, now suggests even sensitive bacteria manage to survive antibiotic treatment as so-called "persister cells." The comprehensive perspective on this phenomenon may contribute to better options of drug treatment and could even inspire the discovery of novel antibiotics targeting these notoriously difficult-to-treat persister bacteria.

In the current issue of the journal *Science*, Alexander Harms and colleagues from the University of Copenhagen summarise newly discovered molecular mechanisms by which bacteria survive antibiotic treatment and cause chronic and recurrent infections.

Harms explains, "This amazing resilience is often due to hibernation in a physiological state called 'persistence,' where the bacteria are tolerant to multiple antibiotics and other stressors. Bacterial cells can switch into persistence by activating dedicated physiological programs that literally pull the plug of important cellular processes. Once they become persisters, the bacteria may sit through even long-lasting antibiotic therapy and can resuscitate, causing relapsing infections at any time after the treatment is abandoned."

Recent work in the field using novel detection methods has uncovered the molecular architecture of several cellular pathways underlying the formation of bacterial persisters—and these results confirmed the long-standing notion that persistence is intimately connected to slow growth or dormancy. Bacterial persistence can therefore be compared to hibernation of animals or the durable spores produced by many mushrooms and plants.

Across many bacteria, these programs are controlled by a regulatory compound known as "magic spot" that plays a central role in the persistence phenomenon. These important discoveries, many of which were accomplished by the BASP Centre, may in the future facilitate the development of improved drug treatment regimens and eventually lead to the development of novel antibiotics.

More information: A. Harms et al, Mechanisms of bacterial persistence during stress and antibiotic exposure, *Science* (2016). DOI: 10.1126/science.aaf4268

Provided by University of Copenhagen