How persistent bacteria are able to avoid antibiotics

December 29 2013

The mechanism by which some bacteria are able to survive antibacterial treatment has been revealed for the first time by Hebrew University of Jerusalem researchers. Their work could pave the way for new ways to control such bacteria.

In addition to the known phenomenon by which some bacteria achieve resistance to antibiotics through mutation, there are other types of bacteria, known as "persistent bacteria," which are not resistant to the antibiotics but simply continue to exist in a dormant or inactive state while exposed to antibacterial treatment. These bacteria later "awaken" when that treatment is over, resuming their detrimental tasks, presenting a dilemma as to how to deal with them. .

Until now, it had been known that there is a connection between these kind of bacteria and the naturally occurring toxin HipA in the bacteria, but scientists did not know the cellular target of this toxin and how its activity triggers dormancy of the bacteria.

Now, the Hebrew University researchers, led by Prof. Gadi Glaser of the Faculty of Medicine and Prof. Nathalie Balaban of the Racah Institute of Physics, have been able to demonstrate how this comes about. Their research showed that when antibiotics attack these bacteria, the HipA toxin disrupts the chemical "messaging" process necessary for nutrients to build proteins. This is interpreted by the bacteria as a "hunger signal" and sends them into an inactive state, (dormancy) in which they are able to survive until the antibacterial treatment is over and they can resume

their harmful activity.

The research on persistent bacteria has been conducted in Prof. Balaban's lab for several years, focusing on the development of a biophysical understanding of the phenomenon. It will be combined with other work being done in Prof. Glaser's laboratory focusing on combating persistent bacteria, in the hope of leading to more effective treatment for bacterial infections.

Working on the project in Prof. Glaser's lab were doctoral student Ilana Kaspy and in the lab of Prof. Balaban by doctoral students Eitan Rotem and Noga Weiss and Dr. Irine Ronin.

Provided by Hebrew University of Jerusalem