

Press Release

Facing apparent resistance to antibiotics, Hebrew U. researchers Develop new techniques to kill dormant bacteria

Biological physics leads to new techniques against dormant pathogens

Jerusalem, July 30, 2008 - Researchers at the Hebrew University of Jerusalem have found new ways to kill dormant bacteria that have become seemingly resistant to antibiotics.

Although antibiotics are the most preferred treatment against bacterial infection and disease, it has become apparent that some diseases cannot be treated by simply administering antibiotics.

Sub-populations of some bacteria can avoid the lethal antibiotics by decreasing their metabolism, remaining dormant for days and waiting for the right opportunity to strike again.

Researchers at the Hebrew University studied these dormant bacteria and found two new ways to kill them: either by subjecting the bacteria to a fresh dose of nutrients together with the antibiotic treatment, or by infecting those dormant bacteria with phages, namely viruses that attack bacteria. In both cases the survival of these dormant bacteria was significantly reduced.

Bio-physicist Dr. Nathalie Q. Balaban at the Hebrew University's Racah Institute of Physics, doctoral student Orit Gefen and master's student Sivan Pearl, recently reported their findings in *Proceedings of the National Academy of Sciences USA* and *PLoS Biology*.

Their research shows that sub-populations of the E. Coli bacteria persist antibiotic treatments by shutting down their activity. The activity was determined by following the production of fluorescent proteins in bacteria trapped on microchips.

The team discovered that protein production does occur in dormant bacteria, immediately after exiting the stationary phase. By exposing the entire bacteria population to antibiotics during this time frame, the team significantly reduced the number of dormant bacteria that survived. These results offer a potentially new way to tackle dormant bacteria, which are the main reason for failure of antibiotic treatments in diseases such as tuberculosis, which often requires months or years of antibiotic treatment.

Also, the results challenge current views as to bacterial dormancy, and suggest an alternative model for the differentiation of normal bacterial cells into dormant ones.

Together with Prof. Oppenheim from the Hebrew University-Hadassah Medical School, the team also studied the interaction between dormant bacteria and phages. They tried to determine whether dormancy evolved as a protection mechanism against phage attack, thus allowing the bacteria to survive under stressful environments. The team showed that the existence of dormant bacteria provides advantage when the population is attacked by lysogenic phage (a phage that may reside inside the bacteria for some generations and only then multiply and attack). Nevertheless, dormancy provided no protection when the bacteria were attacked by lytic phage that reproduces and kills immediately.

According to Dr. Balaban, "These results might lead to new phage therapies for fighting infections that persist despite the antibiotics."

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