New peptide communication factor enabling bacteria to 'talk to each other' discovered

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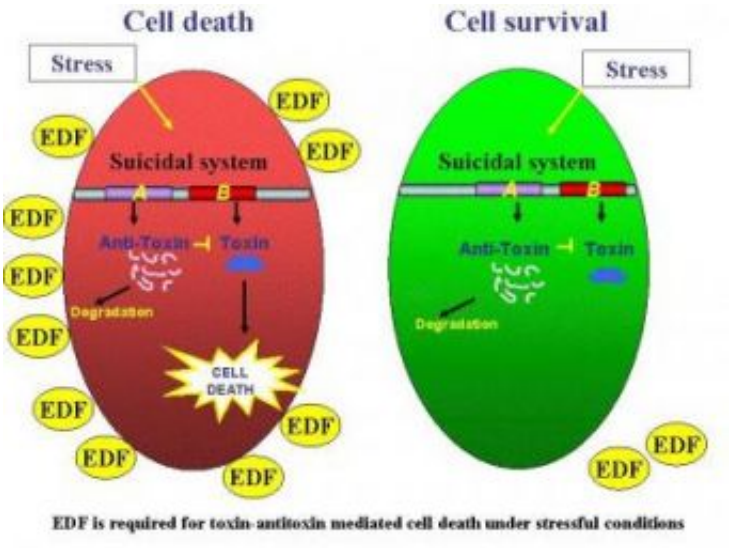

Illustration shows how bacteria under stress (left) dies when exposed to EDF. Credit: The Hebrew University of Jerusalem

Discovery by Hebrew University of Jerusalem researchers of a new communication factor that enables bacteria to “talk to each other” and causes their death could have significant consequences leading to development of a new class of antibiotic medications.

Bacteria are traditionally considered unicellular organisms. However, increasing experimental evidence indicates that bacteria seldom behave as isolated organisms. Instead, they are members of a community in which the isolated organisms communicate among themselves, thereby

manifesting some multi-cellular behaviors.

In an article published Friday (Oct. 26) in the journal *Science*, the Hebrew University scientists describe the new communication factor they have discovered that is produced by the intestinal bacteria Escherichia coli. The new factor is secreted by the bacteria and serves as a communication signal between single bacterial cells.

The research was carried out by a group headed by Prof. Hanna Engelberg-Kulka of the Department of Molecular Biology at the Hebrew University –Hadassah Medical School. It includes Ph.D. student Ilana Kolodkin-Gal , and a previous Ph.D. student, Dr Ronen Hazan. In addition, the research included Dr Ariel Gaathon from the Facilities Unit of the Medical School.

The communication factor formed by Escherichia coli enables the activation of a built-in "suicide module" which is located on the bacterial chromosome and is esponsible for bacterial cell death under stressful conditions. Therefore, the new factor has been designated EDF (Extra-cellular Death Factor).

While suicidal cell death is counterproductive for the individual bacterial cell, it becomes effective for the bacterial community as a whole by the simultaneous action of a group of cells that are signaled by EDF. Under stressful conditions in which the EDF is activated, a major sub-population within the bacterial culture dies, allowing the survival of the population as a whole.

Understanding how the EDF functions may provide a lead for a new and more efficient class of antibiotics that specifically trigger bacterial cell death in the intestine bacteria Escherichia coli and probably in many other bacteria, including those pathogens that also carry the "suicide module."

The discovered communication factor is a novel biological molecule, noted Prof Engelberg-Kulka. It is a peptide (a very small protein) that is produced by the bacteria. The chemical characterization of the new communication factor was particularly difficult for the researchers because of two main reasons: it is present in the bacterial culture in minute amounts, and the factor decomposes under the conditions that are routinely used during standard chemical characterization methods. Therefore, it was necessary to develop a new specific method. The research has also identified several bacterial genes that are involved in the generation of the communication factor, said Prof. Engelberg-Kulka.

Source: The Hebrew University of Jerusalem