A bottom-up view at the aggregation of a bacterial functional amyloid protein

Liraz Chai
Razan Abassi, Neta Lester Zer, Ilanit Ben Simhon, David Azulay, Ido Nir

The Hebrew University of Jerusalem, Institute of Chemistry, Edmond J. Safra campus, Jerusalem 91904, Israel

Liraz.chai@mail.huji.ac.il

Biofilms are groups of microbial cells that are encased in an extracellular matrix (ECM) composed mainly of proteins and polysaccharides. Biofilms can be beneficial, for example when protecting the roots of plants, but they are often detrimental to the host: their formation on medical devices and implants such as catheters, artificial hips, or contact lenses may lead to both acute and chronic infections. The ECM functions as inter-cellular glue and it is also known to protect the cells from external toxins. The major proteinaceous component of the ECM forms fibrillar appendages that are 'functional amyloids'. In contrast to amyloid proteins that are related with disease, functional amyloids are not considered harmful but rather, they have a functional role as they provide mechanical stability to biofilms. The formation of amyloid fibers has been extensively studied in the context of neurodegenerative diseases such as Alzheimer's and Parkinson's disease. However, **very little is known about the mechanisms of functional - amyloid - fiber formation**. In my lab, we use the soil bacterium *B. subtilis* as a model organism for biofilm formation. Specifically, we study inter- and intra- molecular processes that lead to aggregation of the functional amyloid TasA in solution and in the presence of membranes. Our study combines Biochemical methods, spectroscopy (CD and FTIR) as well as Atomic Force Microscopy (AFM) to measure and quantify actual protein – protein interactions. Understanding the properties of the ECM and the mechanisms that underlie its assembly may lead the way for antibiofilm drugs that target the extracellular matrix.

Figures

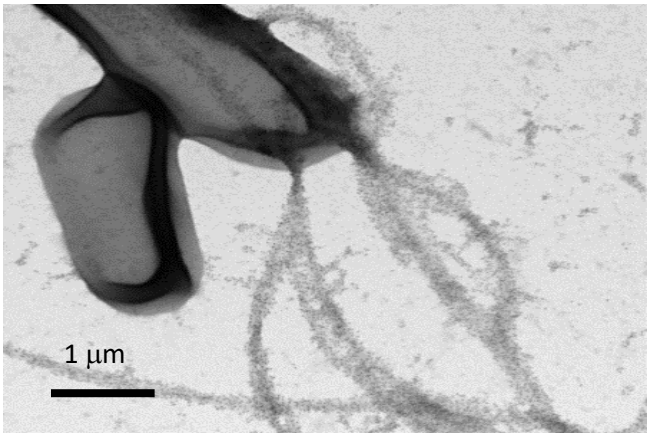

Figure 1: Transmission Electron Micrograph (TEM) view of single *Bacillus subtilis* cells showing the TasA fibers emerging from their surface.