Surface Layer Proteins of *Lactobacillus acidophilus* - A Story of SlpA and SlpX

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Surface layer proteins (Slp) assemble into highly regular 2D crystalline arrays and represent the outermost cell envelope in many bacteria and archaea. The Surface layer (S-layer) is composed mostly of a single (glycol)protein species and is in close contact with their surrounding. Therefore, these arrays fulfill various functions like bacterial adherence to other cells or substrates, protection against life-threatening conditions, and maintenance of the cell shape.

The S-layer of *L. acidophilus* consists of two proteins. SlpA is mainly expressed under normal physiological conditions, whereas SlpX expression is increased under osmotic stress. S-layer proteins have two functional regions in common: a region that is important for the attachment to the cell wall and a region responsible for the self-assembly of the S-layer array.

Our goal is to structurally characterize the S-layer proteins SlpA and SlpX of *L. acidophilus* and to further understand the mechanism of the self-assembly, how the two proteins interact with each other and how the attachment to the cell wall interact occurs. Since full length S-layers form insoluble 2D crystals we designed three functional protein fragments of both proteins and we obtained diffracting crystals of all. In a joint effort and in combination with various different approaches like Hg-SAD, ARCIMBOLDO at a resolution of 1.4Å, ab initio prediction with RoseTTAfold of an only beta-strand protein and molecular replacement we were able to obtain the crystal structures of all protein domains. The structures of the self-assembly regions of SlpA and SlpX show an interesting domain switch and together they suggest the mode of action how the self-assembly of the S-layer occurs.

Keywords: S-layer, SlpA, Lactobacillus

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