

Bacterial Surface Layers Encyclopedia Article

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Bacterial Surface Layers

Bacterial surface layers are regularly arranged arrays, often comprised of the same component molecule, which are located on the surface of **bacteria**. The prototype surface layer is referred to as a S layer.

S layers are found on many bacteria that are recovered from their natural environment, as well as on most of the known archaeobacteria. Examples of bacteria that possess S layers include *Aeromonas salmonicida*, *Caulobacter crescentus*, *Deinococcus radiodurans*, *Halobacterium volcanii*, and *Sulfolobus acidocaldarius*. In many bacteria, the production of the surface layer proteins and assembly of the surface array ceases once the bacteria are cultured in the artificial and nutrient-rich conditions of most laboratory media.

The S layer of a particular bacterium is composed entirely of one type of protein, which self-assembles into the two-dimensional array following the extrusion of the proteins to the surface of the bacterium. The array visually resembles the strings of a tennis racket, except that the spaces between adjacent proteins are very small. In some Gram-positive bacteria the surface layer proteins are also associated with the rigid **peptidoglycan** layer that lies just underneath. The combination of the two layers confers a great deal of strength and support to the bacterium.

Bacterial surface layers are the outermost surface component of bacteria. As such, they modulate the interaction of the bacterium with its external environment, and are the first line of defense against antibacterial compounds. S layers, for example, act as sieves, by virtue of the size of the holes in between adjacent protein molecules. The layer can physically restrict the passage of molecules, such as destructive **enzymes**, that are larger than the pores. The S layer around the bacterium *Bdellovibrio bacteriovorus* even precludes attack from predators of the bacterium.

Some disease-causing bacteria possess S layers. These bacteria include *Corynebacterium diphtheriae* and *Bacillus anthracis*. Microscopic examination of bacteria found in the mouth has also revealed S layers. Possession of surface layers by these bacteria aids the bacteria in avoiding the process of **phagocytosis**. This is thought to be because the protein surface layer makes the bacteria more **hydrophobic** ("water hating") than bacteria of the same species that does not have the surface layer. The increasingly hydrophobic cells are not readily phagocytosed.