The Structure of the Surface Glycoprotein Layer of *Methanoplanus limicola*

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The mesophilic archaebacterium *Methanoplanus limicola* exhibits a remarkable polymorphism: Nearly spherical cells and plate-shaped cells coexist (1). As in most other archaebacteria, a regular surface layer (S layer) is the only macromolecular component of the cell envelope(for a recent review, see ref.(2)). It is made of a single glycoprotein with an apparent molecular mass of 135 kDa, which runs at 115 kDa upon deglycosylation. The glycoprotein layer is firmly attached to the underlying plasma membrane, probably via a special filiform anchoring device(3). We have studied the molecular architecture of this glycoprotein using three-dimensional(3-D) reconstruction techniques from tilt series of negatively stained preparations (3), and surface relief reconstructions of the freeze - dried and metal shadowed preparations. Surface-relief reconstructions of the two faces of the layer, derived from unidirectionally shadowed samples, were combined, making use of the thickness information provided by scanning tunneling microscopy. To attain as high a resolution as possible, efforts were made to minimize post-deposition changes in the metal film (4). In order to better preserve the hydration of the specimens in the electron microscope and to obtain higher resolution. We used aurothioglucose as embedding medium combined with cryo-microscopy and spot-scan image techniques. With image processing we obtained an 8Å projected structure of the 2D-crystalline S layer (5). To obtain quantitative estimates of the various kinds of lattice imperfections that occur in 2-D crystals of biological material. We have subjected some of the images to a deformation analysis, deducing distortion parameters from displacement maps(6). Multivariate statistical analysis(7) was applied as an independent tool to detect and classify interunit cell variations.

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