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Structural biology in the outer membrane of living bacteria

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The outer membrane is a crucial barrier that protects Gram-negative bacteria against harsh environments and restricts cellular entry for antibiotics. It consists of lipopolysaccharides (LPS) and phospholipids and is densely packed with outer membrane proteins. Yet it remains largely unknown how these are organised in the outer membrane, with various indications of non-homogeneous distributions of proteins. We use high-resolution atomic force microscopy (AFM) to study the structure and architecture of the outer membrane organisation on living and metabolically active *E. coli* at molecular resolution. Considering wild-type and mutant bacteria and overcoming the lack of chemical resolution of AFM by novel labelling methods, we reveal that three different, segregated phases can be distinguished at the *E. coli* surface: An extensive network of proteins in an imperfect lattice spanning the entire bacterial surface; LPS islands of up to several 10s of nm; and, for disrupted outer membranes, phospholipid patches that represent weak chinks in the bacterial armour and that facilitate entry of antibiotics into the periplasm.

Session

Structural biology

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