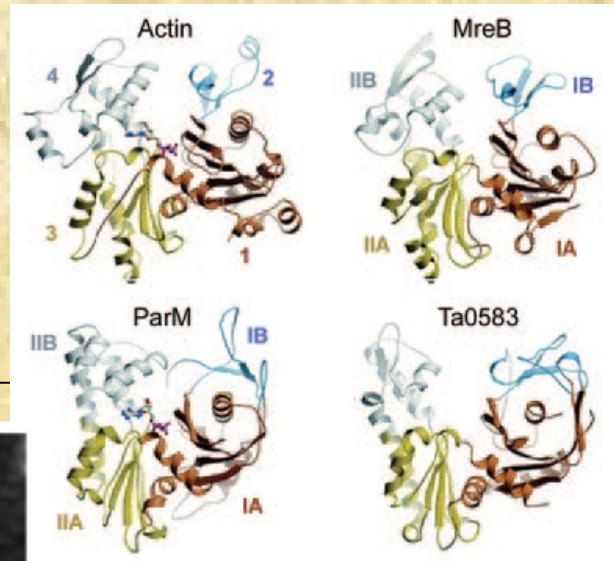




The ABC of Actin-like Bacterial Cytoskeleton

For many years prokaryotes were thought not to have cytoskeleton. Recently scientists have isolated homologues to all eukaryotic cytoskeletal elements. Actin-like proteins have been isolated from both Bacteria and Archaea. Even though they have little sequential homology to actin (11 to 35%) they are very similar to it structurally and functionally.



Three structural homologues of actin



MreB helix

MreB (murein cluster e) is essential for the shape of rod-like bacteria (*B. subtilis*, *E. coli*, *C. crescentus*), but it is not found in spherical shaped bacteria like cocci. It forms a helix under the plasma membrane, assisted by MreC and MreD.

MreB is also involved in:

- cell division
- chromosomal DNA segregation
- differentiation and spore formation
- cell wall formation through accessory proteins
- Intracellular transport by serving as a track

Loss of MreB leads to:

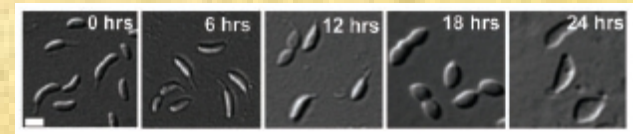
- unequal cell divisions and daughter cells with different size
- loss of rod shape
- slow growth
- cold sensitivity

MreB polymerization:

- mediated by ATP/GTP hydrolysis
- no nucleation
- monomers are actually protofilaments

ParM mediates plasmid transport and segregation during cell division. It builds a double helix, similar to actin in eukaryotes.

Ta0583 was isolated in the Archaea *Thermoplasma acidophilum*. Structural studies have placed it into the actin superfamily but functional properties are still not clear.



Bacteria without MreB tend to lose their rod-like form and assume a spherical one.