

s8a.m5.o5 The striking similarity between the bacterial cell division protein FtsA and actin. F.M.I. van den Ent, J.Löwe, *MRC-LMB, Hills road, Cambridge CB2 2QH, UK*
Keywords: macromolecular assemblies.

Notes

Cell division in prokaryotes involves a series of events that is concluded by the constriction of the cell wall leading to the segregation of the two daughter cells. It is mediated by a complex of proteins, called the divisome, that consists of several essential cell division proteins¹. The filamentous temperature-sensitive proteins FtsA and FtsZ are essential for the formation of the divisome. Polymerization of FtsZ molecules at the division site is the first step of septum formation. FtsA is then recruited to the FtsZ-ring, probably via a direct interaction with FtsZ. Similarly, other components of the divisome are localized to the midcell, where the mechanochemical process of bacterial cell envelope constriction takes place.

Elucidation of the three-dimensional structure of FtsZ² has shown similarity to that of tubulin. Although the proteins have only 20 % of their sequence in common, the similar fold has suggested that they have evolved from a common ancestor. As they share at least some of their functional properties, like the formation of filaments.

In an analogous manner, it has been suggested that the structure of FtsA may be similar to that of actin, which is the building block of the actin cytoskeleton in eukaryotes. We have determined the three-dimensional structure of FtsA from *Thermotoga maritima* at 1.9Å resolution. Comparison of the structure of FtsA to that of the actin family of proteins demonstrates that they are indeed strikingly similar, including the nucleotide binding site. The relationship to proteins of the actin family and implications for the origin of the eukaryotic cytoskeleton will be discussed.

[1] L. Rothfield S. Justice, J. GarciaLara. Bacterial cell division. Annual Review of Genetics, (1999), 33: 423-448.

[2] J.Löwe & L.A. Amos. Crystal structure of the bacterial cell division protein FtsZ. Nature, (1998), 391: 203 - 206.