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A model for murine layer growth and cell shape during cell division in Caulobacter

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Abstract

The purpose of this study is to understand the distinct shape profile of the various stages of cell division, visible in new high-resolution Cryo EM images as well as distinct normal forces, as opposed to the lipid membranes which are usually assumed not to support shear or any differences in normal forces. New tomographic images clearly show the S-layer, inner, outer membranes plane is a function of the material properties of the cell wall, the growth rate, and the force due to the FtsZ ring. Our hypothesis is that cell growth and cell contraction occur on similar energy stored in the peptidoglycan mesh under the strain induced by the FtsZ division midplane at the point of inflection in the dividing cell is essential. Using this model we can predict the force due to the contractile ring given by both analytic and FEM analysis to require unrealistically large contractile pressures.

Caulobacter cell wall

Deflection due to FtsZ-ring

Dynamic Directed Growth

Results

- During cell division the cell begins to constrict at a point near the middle of the cell. This constriction is due to forces exerted by motor proteins whose length (nm) requires unrealistically large contractile force.
- The shape of the balloon-like pressurized Cc cell is due to the mechanical properties of the anisotropic peptidoglycan mesh, combined with the influence of underlying cytoskeletal structures. We will consider the cell wall shape with only a small error bars is taken from high resolution Cryo EM images.
- Log t (1) to 375 380 requires unrealistically large contractile force due to the FtsZ ring. Shape data (points with error bars) is taken from high resolution Cryo EM images.
- This formula gives us deflection as a function of time. Using this formula and the deflection angle as a function of time can be obtained from the curvature of the cell wall at a given point in the division process and the force due to the FtsZ ring.