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Self-organization of the MinE ring in subcellular Min oscillations
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In the bacterium *Escherichia coli*, the mid-cell positioning of division is achieved by the sub-cellular oscillation of Min proteins. MinD interacts with the membrane and polymerizes into filaments. MinE binds to membrane bound MinD leading to the depolymerization of the MinD filaments. It has been observed experimentally that MinE forms a ring, known as the E-ring, near the end of the MinD polymers. We model and solve the self-organization of the E-ring. Rebinding of MinE to depolymerizing MinD filament tips controls MinE ring formation. We find two types of E-ring profiles near the filament tip: a strong plateau-like E-ring as seen *in vivo*, controlled by 1D diffusion along the bacterial length, or a weak cusp-like E-ring controlled by 3D diffusion near the filament tip. We discuss the initial instability that leads to MinD filament depolymerization and the formation of the E-ring. We also discuss the duration of transients leading towards strong or weak E-rings. We compare with experiment both in *vivo* and *in vitro*.

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