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Why nozzles are required for bacterial gliding?[1] JUNHWAN JEON, ANDREY DOBRYNIN, Polymer Program, Institute of Material Science, University of Connecticut — Many microorganisms transduce an energy stored during polymerization reactions into mechanical force propelling them over surfaces. For example, cyanobacteria has nozzles-like organelles secreting a polysaccharide gel. On the other hand, listeria propels itself through the cell by polymerizing a network of actin filaments from its surface. The actin filaments have a persistence length of the order of $2-10\mu m$ leading to the high value of Young's modulus (10^3-10^4Pa). The polysaccharide gel has lower shear modulus (10^2Pa) than that of the actin gel and does not have sufficient strength to support compression and propel bacteria. In this case nozzles play a role of the compression chambers that improve the elastic properties of a gel resulting in bacteria translocation. To elucidate the effect of chain rigidity on bacterial motility, we performed molecular dynamics simulations of crosslinked semiflexible polymers growing inside a nozzle-like orgenelle and from the surface of a bacteria. We have analyzed the correlation between object's velocity and the chain stiffness.

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Junhwan Jeon
Polymer Program, Institute of Material Science, University of Connecticut

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