Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Passive and active response of bacteria under mechanical compression RENATA GARCES, Third Institute of Physics - Georg August University, Goettingen, SAMANTHA MILLER, The University of Aberdeen, CHRISTOPH F. SCHMIDT, Third Institute of Physics - Georg August University, Goettingen, BYOPHYSICS TEAM, THE INSTITUTE OF MEDICAL SCIENCES COLLABORATION — Bacteria display simple but fascinating cellular structures and geometries. Their shapes are the result of the interplay between osmotic pressure and cell wall construction. Typically, bacteria maintain a high difference of osmotic pressure (on the order of 1 atm) to the environment. This pressure difference (turgor pressure) is supported by the cell envelope, a composite of lipid membranes and a rigid cell wall. The response of the cell envelope to mechanical perturbations such as geometrical confinements is important for the cells survival. Another key property of bacteria is the ability to regulate turgor pressure after abrupt changes of external osmotic conditions. This response relies on the activity of mechanosensitive (MS) channels: membrane proteins that release solutes in response to excessive stress in the cell envelope. We here present experimental data on the mechanical response of the cell envelope and on turgor regulation of bacteria subjected to compressive forces. We indent living cells with micron-sized beads attached to the cantilever of an atomic force microscope (AFM). This approach ensures global deformation of the cell. We show that such mechanical loading is sufficient to gate mechanosensitive channels in isosmotic conditions.

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Date submitted: 12 Nov 2016 Electronic form version 1.4