Mechanical properties and adhesion of flagellated eukaryotic cells

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We study the mechanical behavior of *Volvox globator*, a green algae colony composed of several hundreds of single flagellated cells, forming a cellular monolayer at the surface of the spherical object. The mechanical properties are characterized in vivo by means of micropipette force sensors, a novel technique that is capable of quantifying forces down to the pN level for microscopic objects and that allows for quantitative force-shape correlations, e.g. in adhesion, friction and deformation scenarios. We show that a Kelvin-Voigt model, comprising an elastic and a viscous component, is in excellent agreement with the mechanical response of the cell colony. The viscous component is found to be rate-dependent, giving rise to a shear-thinning, non-Newtonian behavior. In the second part, we report on in vivo adhesion experiments on the single cell level in order to characterize the interactions of *Chlamydomonas reinhardtii* and its flagella with interfaces. For this organism, flagella play a crucial role since they are the source of locomotion and may come into direct contact with interfaces. In micropipette deflection experiments, we observe that only the flagella and not the cell body may adhere to surfaces and provide precise adhesion force measurements of eukaryotic flagella to different model substrates.