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Weakening the Cell Elasticity of Chlorella Vulgaris under Nitrate Starvation ANTONIO NAVA, Astronomy and Physics Dept., University of Denver, LIEVE LAURENS, NICHLOLAS SWEENEY, National Bioenergy Center, National Renewable Energy Laboratory, SEAN SHAHEEN, Astronomy and Physics Dept., University of Denver, NATIONAL BIOENERGY CENTER, NATIONAL RENEWABLE ENERGY LABORATORY COLLABORATION — *Chlorella vulgaris* is a unicellular, photosynthetic green alga. This strain of Chlorella is capable of producing high lipid content—up to 50% of its dry biomass when experiencing severe nutrient stress. The strength of the cell wall influences the susceptibility of the cells to rupture and is hypothesized to be related to extractability of the lipids. Upon nutrient deprivation, algal cells increase lipid content but concurrently a reduction in extraction efficiency has been observed. To study algal cell wall elasticity, Chlorella cells were grown in replete medium, which over time became deplete in nitrate and other nutrients. Samples were harvested at three distinct time points. Through Atomic Force Microscope (AFM) measurements, we obtained force vs distance data as the AFM probe tip is brought in contact with an immobilized cell, thus deforming its surface. The Hertz model for membrane deformation, modified to account for AFM probe shape, is used to fit to the quadratic curve from the force curve measurements. By fitting the model to the data, the Young's Modulus for the cell can be extracted. Analysis of the data leads to the conclusion that nitrate deprivation results in a decreased Young's Modulus of the cell.

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