Physical Chemistry Seminar

Tuesday, April 15, 2014 | **11:00 am** | **Room 1315 Chemistry Building**

Bacterial cell wall mechanics

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The peptidoglycan (PG) consists of a single, cross-linked layer of polysaccharide that forms the primary load-bearing material of bacteria and resists the large osmotic pressure across the cell wall. As defects in PG assembly and remodeling are catastrophic to cells, mechanistic studies in this area may lead to the discovery of new targets and antibiotics that inhibit cell wall assembly. In the first part of my talk, I describe a technical approach we have developed to measure the stiffness of the cell wall of growing bacteria. We refer to this technique as CLAMP: cell length analysis of mechanical properties, as it effectively describes a polymer clamp technique for determining the composite Young's modulus for the cell wall (E_{cell}). Importantly, E_{cell} can be translated into changes in PG mechanical properties and provide insight into several properties of this material, including: 1) its structure; 2) its conservation across Eubacteria; and 3) its response to chemical and biological perturbations. In the second part of my talk I describe the application of a high-throughput variation of CLAMP to study *mechanical genomics*—that is, quantifying how genome-wide alterations influence cell mechanical properties. We have used CLAMP to screen an entire gene deletion library in *Escherichia coli* (~3700 mutants) and have correlated the loss of each gene with cell wall mechanical properties. This approach has enabled us to identify new machinery and regulators of PG and cell wall assembly and has yielded some very surprising results. I describe the results of these experiments and how it is shaping our view of the assembly, properties, and function of the cell wall, and providing targets for antimicrobial chemotherapy.

Refreshments will be available prior to the seminar at 10:45 a.m. outside room 1315

Graduate Students may meet with the speaker at 1:00 p.m. in Room 8335