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Characterizing Complexes of DNA and Elastin-like Polypeptides

Bryce Noe
Cleveland State University

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Washkewicz College of Engineering

Student Researcher: Bryce Noe

Faculty Advisor: Nolan B. Holland

Abstract

Elastin-like polypeptides (ELPs) are a class of environmental responsive materials. When prepared with a protein motif that selectively binds to nucleic acids, a nucleic acid-ELP complex can be formed, conferring the responsive properties of ELP onto the nucleic acid. One possible use for such a complex is in DNA origami, where nano-scaled assemblies of DNA can be transformed into nanomachines by using the ELP as an actuator. Other possible uses include the isolation and extraction of a selected strands of genetic material, or the delivery of genetic material to a cell. Using a bacterial expression system, our lab has prepared ELPs with one such DNA binding motif, TAT, which is associated with immunodeficiency viruses. As the TAT-ELP was purified, we observed that it extracted bacterial genetic material along with it. To characterize these nucleic acid-ELP complexes, temperature dependent properties, full UV absorbance spectra, and particle sizing data were collected. Compared to a solution of pure ELP the nucleic acid ELP complex aggregates at a much lower temperature. The absorbance values of the complex show that the complex has a maximum absorbance at a different value than pure ELP. Particle sizing results showed multiple distinct sizes for the complex, as opposed to a singular size for ELP aggregates.