Abstract
Advances in molecular biology techniques have been useful in engineering protein-based biomaterials. We aim to design novel synthetic biodegradable protein polymer constructs composed of unique block polymers via genetic engineering techniques. By combining cartilage oligomeric matrix protein coiled-coil (COMPcc) and elastin-like polypeptide (ELP), we can generate diblock and triblock copolymers. We have synthesized and purified the homopolymers COMPcc and ELP, along with the COMPcc-ELP and ELP-COMPcc diblock copolymers, as well as the triblock ELP-COMPcc-ELP. These polymers have been characterized via circular dichroism (CD), dynamic light scattering and fluorescence. In addition, we will use molecular biology techniques to generate block copolymers with smaller ELP sequences to understand the behavior of smaller ELPs.

Biosynthesis of Block Co-Polymers

Homopolymer CD

CD Analysis of the COMPcc Peptide (30μM)

CD Analysis of the ELP Monomer (0.75 μM, 0.06 mg/mL)

Di-Block Polymer CD

ELP-COMPcc Diblock (2.58 μM, 0.06 mg/mL)

COMPcc-ELP Diblock (2.86 μM, 0.06 mg/mL)

Tri-Block Polymer CD

Triblock (1.14 μM, 0.01 mg/mL)

Dynamic Light Scattering

Dynamic Light Scattering of ELPs

Fluorescence

Fluorescence of COMPcc Homopolymer Binding

Fluorescence of ELP Binding at 480 nm

Conclusions & Future Work

We have successfully generated and purified all constructs including the homopolymer, di-block co-polymers, and tri-block co-polymer.

We have preliminary results for characterization of the constructs via CD, fluorescence, and AFM. We will continue to characterize constructs via fluorescence, dynamic light scattering, and MALDI in the future.

We hope these block copolymers will provide protein engineers with an extra level of control for drug delivery.

These will also serve as novel scaffolds for tissue engineers.

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