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# Design of Synthetic Alternatives to Biologics in Medicine



**Suzie H. Pun**

**Robert F. Rushmer Professor of  
Bioengineering; Adjunct Professor,  
Clinical Engineering  
University Washington, Seattle, WA**

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**Abstract:** Biologics, products produced from living organisms, have revolutionized treatment of disease. Examples of FDA-approved biologics include therapeutic proteins (e.g. blood clotting factors and antibodies), engineered viruses for gene therapy, and cell therapies. Biologics are addressing previous unmet medical needs, but are challenging to manufacture and therefore high in cost. In this talk, I will describe our efforts to develop synthetic alternatives to biologics used in medicine. In the first example, a multivalent polymer displaying a fibrin-binding peptide was developed as a synthetic alternative to recombinant proteins used in trauma medicine. The second example, a polymer that facilitates intracellular delivery of nucleic acids and peptides was synthesized based on design principles learned from adenoviral vectors. In a final example, a unique aptamer with high affinity for T cell marker CD8 was discovered and applied as an alternative to antibodies for T cell isolation in the manufacturing process for CAR T cells.