Peptides are versatile materials that can possess biological function and also be easily synthesized and incorporated into biomaterials. Polymers can enhance the biological action of peptides in multiple ways. In a first example, a multivalent polymer displaying a fibrin-binding peptide was synthesized by controlled radical polymerization. The resulting polymer incorporates into forming clots and increases clot strength while improving resistance to clot lysis. Delivery of this polymer to a rat model of trauma significantly improved survival compared to controls. We have also recently applied this polymer to investigate the role of fibrin in cancer metastasis. Fibrin stabilization alters the tumor microenvironment and affects disease outcome. These studies show that synthetic polymers can be used to as a complementary tool to transgenic animals and pharmacologic inhibitors in the study of disease. In a second example, we developed a polymer that selectively displays a membrane-disrupting peptide in acidic pH. This polymer promotes efficient endosomal release and was used to deliver a variety of macromolecular drugs.

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