Professor Ashutosh Chilkoti

Professor of Biomedical Engineering
Director, Center for Biologically Inspired Materials and Material Systems , Duke University

"Translating Molecular Bioengineering from the Lab to the Patient"
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This talk will highlight recent work from my laboratory that illustrates the clinical translation of molecular bioengineering technologies for point-of-care clinical diagnostics and drug delivery for the diagnosis and treatment of type 2 diabetes and cancer. In the first example, I will discuss a point-of-care diagnostic that we have developed, in which all reagents are printed and stored on a "non-fouling"—protein and cell resistant—polymer brush. The D^4 assay, involves four sequential events: (1) **D**ispense (droplet of blood); (2) **D**issolve (printed reagents on chip); (3) **D**iffuse (across surface); and (4) **D**etect (binding event). Examples of quantitative dose-response from whole blood and the integration of the assay with a smart phone compatible detector will be presented. The D4 assay can be used for the diagnosis of cardiac markers with a speed and sensitivity that is as good or better than commercially available point-of-care tests and is far simpler, cheaper more rugged, and does not require a cold-chain.   In the area of drug delivery, I will highlight two technologies with broad applicability. In the first design, I will describe an injectable delivery system— **P**rotease **O**perated **D**epot (POD)—based on thermally sensitive polypeptides for the sustained and tunable release of peptide drugs from a subcutaneous injection site. In the second example, I will discuss a general method, attachment-triggered self-assembly of recombinant peptide polymers that packages small hydrophobic molecules into soluble polymer nanoparticles. Because many cancer chemotherapeutics are insoluble small molecules with poor bioavailability, this approach has great utility to increase the solubility, plasma half-life and tumor accumulation of many cancer chemotherapeutics.