

BME 695L Engineering Nanomedical Systems

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"Basic concepts of nanomedical systems"

- I. Features of Nanomedicine
 - A. Bottoms up rather than top down approach to medicine
 - B. Nano-tools on the scale of molecules
 - C. Cell-by-cell repair approach – regenerative medicine
 - D. Feedback control system to control drug dosing

- II. Elements of good engineering design
 - A. Whenever possible, use a general design that has already been tested
 - B. Use multiple specific molecules to do multi-step tasks
 - C. Control the order of molecular assembly to control the order of events
 - D. Therefore, perform the molecular assembly in reverse order to the desired order of events

- III. Building a nanodevice
 - A. Choice of core materials
 - B. Add drug or therapeutic gene
 - C. Add molecular biosensors to control drug/gene delivery
 - D. Add intracellular targeting molecules
 - E. Result is multi-component, multi-functional nanomedical device
 - F. For use, design to de-layer, one layer at a time
 - G. The multi-step drug/gene delivery process in nanomedical systems

- IV. The challenge of drug/gene dosing to single cells
 - A. Precise targeting of drug delivery system while protecting non-targeted cells from exposure to the drug
 - B. How to minimize mis-targeting
 - C. How to deliver the right dose per cell
 - D. One possible solution – in situ manufacture of therapeutic genes

References:

Prow, T.W., Rose, W.A., Wang, N., Reece, L.M., Lvov, Y., Leary, J.F. "Biosensor-Controlled Gene Therapy/Drug Delivery with Nanoparticles for Nanomedicine" Proc. of SPIE 5692: 199 – 208, 2005.