BME 695L Engineering Nanomedical Systems
October 18, 2007

Lecture 15: Nanodelivery of therapeutic genes & molecular biosensor feedback control systems

I. Introduction and overview
   A. Some of the advantages of therapeutic genes
   B. Some of the advantages of molecular biosensor feedback control systems
   C. Why a nanodelivery approach is appropriate

II. The therapeutic gene approach
   A. What constitutes a "therapeutic gene" ?
   B. Transient versus stable expression modes

III. Molecular feedback control systems
   A. Drug delivery has traditionally not used feedback controls
   B. Why feedback control might be a very good idea!
   C. Positive or negative feedback?

IV. Molecular Biosensors as a component of a nanomedicine feedback control system
   A. What is a molecular biosensor?
   B. How a molecular biosensor functions as a therapeutic gene switch

V. Building integrated molecular biosensor/gene delivery systems –some examples
   A. Required components
   B. Example of a ribozyme/antivirus system
   C. Example of an ARE biosensor/DNA repair system

References

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5. Prow, T.W., Grebe, R., Merges, C., Smith, J.N., McLeod, D.S., Leary, J.F., Gerard A. Lutty, G.A. "Novel therapeutic gene regulation by genetic biosensor tethered to magnetic nanoparticles for the detection and treatment of retinopathy of prematurity" Molecular Vision 12: 616-625, 2006.
6. Prow, T.W. “Nanomedicine – Targeted Nanoparticles for the delivery of Biosensors and Therapeutic Genes” PhD Thesis, University of Texas Medical Branch, January 2004.