BME 695L Engineering Nanomedical Systems
November 6, 2007

Lecture 18: Designing nanodelivery systems for in-vivo use

I. Overview – the *in-vitro* to *ex-vivo* to *in-vivo* paradigm
   A. In-vitro - importance of choosing suitable cell lines
   B. Ex-vivo – adding the complexity of in-vivo background while keeping the simplicity of in-vitro
   C. In-vivo - all the complexity of ex-vivo plus the "active" components of a real animal

II. In-vivo systems are open, "active" systems with multiple layers of complexity
   A. in-vitro and ex-vivo are mostly "closed" systems, but not absolutely
   B. what is an "open" system?
   C. attempts to isolate open systems

III. Layers of complexity of in-vivo systems
   A. human cells in nude mice – a mixture of in-vitro and in-vivo
   B. "model" small animal systems
   C. better model larger animal systems

IV. Examples of the in-vitro to in-vivo experimental pathway
   A. Kopelman group – multifunctional NPs for MRI and photodynamic therapy
   B. Langer group – aptamer-targeted NPs for cancer therapy in-vivo
   C. Leary group – peptide-guided NPs to human tumors in nude mice
      magnetic nanoparticles as MRI contrast agents in tissue phantoms

References

Kopelman, R., Koo, Y-E, Philbert, M., Moffatc, B.A., Reddy,G.R., McConville, P., Hall, D.E., Chenevert, T.L., Bhojanie, M.S., Buck, S.M., Rehemtulla, A., Ross, B.D. Multifunctional nanoparticle platforms for in vivo MRI enhancement and photodynamic therapy of a rat brain cancer. Journal of Magnetism and Magnetic Materials 293: 404–410, 2005.

Farokhzad, O.C., Cheng, J., Teply, B.J., Sherifi, I., Jon, S., Kantoff, P.W., Richie, J.P., Langer, R. Targeted nanoparticle-aptamer bioconjugates for cancer chemotherapy in vivo. PNAS 103(16), 6315–6320, 2006