

Forbes Laboratory

Research Interests: Cancer Metabolism, Targeted Drug Delivery, Bacteriolytic Therapy

Our laboratory focuses on developing therapeutics to treat regions of tumors that are inaccessible to standard cancer therapies. Blood-borne therapeutics rely on diffusion for delivery and do not accumulate in effective concentrations distant from vasculature. This problem will be especially compounded for the next generation of therapeutics, especially antibodies, liposomes and viral vectors, because of their larger size and subsequently reduced interstitial diffusivity. To address this limitation we are currently quantifying the microenvironment of the inaccessible tumor regions and designing bacterial vectors targeted to those regions. We are also using surgical techniques to investigate how bacteria migrate and proliferate in subcutaneous mouse tumors. By applying engineering principles to the design of cancer therapeutics they hope to create strategies more effective at treating these tumor regions in order to reduce local failure and metastasis, which both lead to patient morbidity and mortality.

Selected Publications

Venkatasubramanian R, Henson MA, **Forbes NS**. 2006. Incorporating energy metabolism into a growth model of multicellular tumor spheroids. Published online in *J Theor Biol*, DOI: 10.1016/j.jtbi.2006.03.011.

Kasinskas RW, **Forbes NS**. 2006. *Salmonella typhimurium* specifically chemotax and proliferate in heterogeneous tumor tissue *in vitro*. *Biotechnology Bioengineering*, 94:710-721.

Han G, You CC, Kim BJ, Turingan RS, **Forbes NS**, Martin CT, Rotello VM. 2006. Light-regulated release of DNA and its delivery to nuclei by means of photolabile gold nanoparticles. *Angew Chem Int Ed Engl*. 45:3165-3169.

Hong R, Han G, Fernandez JM, Kim BJ, **Forbes NS**, Rotello VM. 2006. Glutathione-mediated delivery and release using monolayer protected nanoparticle carriers. *J Am Chem Soc*. 128:1078-9.

Forbes NS, Munn LL, Fukumura D, Jain RK. 2003. Sparse initial entrapment of systemically injected *Salmonella typhimurium* leads to heterogeneous accumulation within tumors. *Cancer Res*. 63:5188-5193.

Jain RK, **Forbes NS**. 2001. Can engineered bacteria help control cancer? *PNAS* 98:14748-14750

Forbes NS, Clark DS, Blanch HW. 2001. Using isotopomer path tracing to quantify metabolic fluxes in pathway models containing reversible reactions. *Biotech. Bioeng*. 74:196-211.

Professional Highlights

Outstanding Graduate Student Instructor University of California, Berkeley
Member of the following professional societies: American Institute of Chemical Engineers, American Association of Cancer Researcher, International Society of Pharmaceutical Engineers, Society of Biological Engineering

Member of UMass Institute for Cellular Engineering, Chemistry Biology Interface, and MassNanoTech



Neil S. Forbes, PhD

Assistant Professor, Chemical Engineering and Adjunct Professor, Molecular and Cell Biology, University of Massachusetts Amherst

Education

B.S., Chemical Engineering, Case Western Reserve University

Ph.D., Chemical Engineering, University of California, Berkeley

Postdoctoral

Radiation Oncology/Tumor Biology

Harvard Medical School / Massachusetts General Hospital, 2000-2002

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