Richard J. Price

Associate Professor of Biomedical Engineering and Neurological Surgery

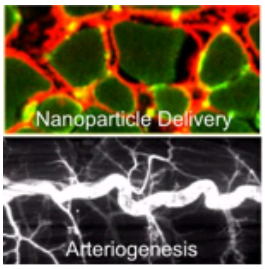
B.S., Rochester Institute of Technology, 1990
M.S., Biomedical Engineering, University of Virginia, 1992
Ph.D., Biomedical Engineering, University of Virginia, 1995

Department of Biomedical Engineering
University of Virginia
Box 800759 Health System
Charlottesville, VA 22908

Office: Room 2316 Phone: 434-924-0020
Lab: Room 2216 Phone: 434-243-9378
rprice@virginia.edu

Research Interests

Ultrasound Targeted Delivery of Nanoparticle Drug and Gene Carriers



The targeted delivery of intravascularly injected genes and drugs to specific regions deep within the body remains a significant challenge in the treatment of many pathological conditions. To address this problem, we are developing ultrasound-activated drug delivery systems that are comprised of various combinations of biodegradable polymer nanoparticles and contrast agent microbubbles. As these agents pass through an ultrasound-targeted region, the microbubble components oscillate and induce microvessel permeabilization which then facilitates the deposition of the controlled-release drug-bearing nanoparticles in the tissue. In pre-clinical studies, we are using these ultrasound-activated drug delivery systems for restoring blood flow to ischemic tissue via growth factor delivery and therapeutic arteriogenesis and for treating brain tumors via enhanced chemotherapeutic drug deposition.

Regulation of Microvascular Structure by Hemodynamic Forces and Bone Marrow-Derived Cells

The formation of new microvessel networks is a critically important event in many normal and pathological adaptations. Proper network assembly involves the formation of new capillaries and the subsequent investment of these new capillaries with perivascular smooth muscle cells. At present, the laboratory is primarily focused on understanding the regulation of microvascular growth and structure during inflammation and wound healing through the use of numerous transgenic, knockout, and chimeric mouse models. Specific projects are aimed at determining how VEGF and shear stress regulate endothelial cell phenotype and function during capillary sprouting and how the chemokine-selective recruitment of bone marrow-derived cell subpopulations affects microvascular blood vessel growth through differential paracrine growth factor signaling.

Recent Publications

Nickerson MM, Burke CW, Meisner JK, Shuptrine CW, Song J, Price RJ
Capillary arterialization requires the bone marrow-derived cell (BMC)-specific expression of chemokine (C-C motif) receptor-2, but BMCs do not transdifferentiate into microvascular smooth muscle.

Nickerson MM, Song J, Meisner JK, Bajikar S, Burke CW, Shuptrine CW, Owens GK, Skalak TC, Price RJ
Bone Marrow-Derived Cell-Specific Chemokine (C-C motif) Receptor-2 Expression is Required for Arteriolar Remodeling.

Nickerson MM, Song J, Shuptrine CW, Wieghaus KA, Botchwey EA, Price RJ
Influence of poly(D,L-lactic-co-glycolic acid) microsphere degradation on arteriolar remodeling in the mouse dorsal skinfold window chamber.

Wieghaus KA, Nickerson MM, Petrie Aronin CE, Sefcik LS, Price RJ, Paige MA, Brown ML, Botchwey EA
Expansion of microvascular networks in vivo by phthalimide neovascular factor 1 (PNF1).

Anderson CR, Hastings NE, Blackman BR, Price RJ
Capillary sprout endothelial cells exhibit a CD36 low phenotype: regulation by shear stress and vascular endothelial growth factor-induced mechanism for attenuating anti-proliferative thrombospondin-1 signaling.

Chappell JC, Song J, Burke CW, Klibanov AL, Price RJ

Targeted delivery of nanoparticles bearing fibroblast growth factor-2 by ultrasonic microbubble destruction for therapeutic arteriogenesis.

More Publications

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