

CHEMICAL ENGINEERING

SEMINAR SERIES



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Bypassing the blood-brain barrier: physiologic determinants & transport considerations for CNS delivery and distribution of macromolecules

ABSTRACT: Successful targeted delivery of macromolecules to the brain has remained a major, largely unmet medical challenge for decades. My laboratory has focused on understanding some of the key physiologic determinants of CNS delivery: (i) local transport processes governing distribution after injection into the brain parenchyma, (ii) whole-brain distribution and clearance mechanisms following intrathecal infusion, and (iii) nasal pathways for brain targeting after intranasal administration. Our recent studies have investigated how physiological mechanisms, specific binding interactions, and size/charge effects may combine to affect central delivery and distribution by employing a variety of different labeled tracer macromolecules, including antibodies, antibody fragments and oligonucleotides. Examples will be presented to reveal how diffusive transport processes in brain extracellular space, binding, and fluid flow in cerebrospinal and perivascular fluid compartments affect the central delivery and distribution of macromolecules as well as suggest new ways in which to enhance delivery.

RECEPTION 3:30 • LECTURE 4:00 - 5:00
PHYSICS ASTRONOMY BLDG. (PAA) A110



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BIOGRAPHY: Dr. Thorne has a B.S. in Chemical Engineering from the University of Washington (1990) and a Ph.D. in Pharmaceutics from the University of Minnesota (2002). Following postdoctoral research in neuroscience and biophysics (New York University School of Medicine), he served as an instructor in the Department of Physiology and Neuroscience at the New York University School of Medicine before joining the faculty at the University of Wisconsin-Madison in 2010. The Thorne laboratory studies diffusive and convective transport within the extracellular and perivascular spaces of the central nervous system. They aim to leverage knowledge of physiology and central nervous system structure with a variety of methods in order to identify new ways to effectively deliver biologics to the brain and to better understand how endogenous proteins such as antibodies distribute within the central compartment. Dr. Thorne recently chaired the 2016 'Barriers of the CNS' *Gordon Research Conference* (<http://www.grc.org/programs.aspx?id=12833>) and also serves on the editorial board of *Fluids and Barriers of the CNS* and the Council/Steering Committee of the *International Brain Barriers Society* (<http://www.ibbsoc.org/>).