



## Biomedical Engineering Seminar Series

Johns Hopkins School of Medicine and the Whiting School of Engineering

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**Monday, January 30, 2012, at 1:30**

Medicine Campus, Talbot Library, Traylor 709  
Video-conferenced to Homewood Campus,  
Rome Room, Clark 110

Host: Dr. Elliot McVeigh  
Light lunch will be served in Traylor 709



## **Dendrimer-based nanotherapeutics for the treatment of neuroinflammation**

### Abstract:

Neuroinflammation, caused by activated microglia and astrocytes, plays a key role in the pathogenesis of cerebral palsy (CP), retinal degeneration, and other debilitating neurodegenerative disorders. Targeted attenuation of neuroinflammation, aimed at activated microglia and astrocytes, can be a potent therapeutic strategy. However, drug delivery to the central nervous system is strongly restricted for most drugs by the blood-brain-barrier, making treatment of diffuse neuroinflammation a challenge. We take advantage of the unique, intrinsic, pathology-dependent biodistribution patterns of dendrimers (with no targeting moieties) in diseases models of neurodegeneration. For example, dendrimers are transported to the periventricular region of the brain of newborn rabbit kits with cerebral palsy (CP), whereas little brain uptake is seen in healthy animals. Interestingly, they further localize selectively in activated microglia and astrocytes in animals with CP. Such selective localization in activated microglia is also seen in retinal degeneration models, upon intravitreal administration. Building on these findings, we have designed and synthesized dendrimer-drug nanodevices, taking advantage of their rich surface functionality using appropriate linking chemistry. They can deliver and release the drug in the targeted tissue in a tailored and sustained manner. Two examples of this approach of targeting neuroinflammation the retina (intravitreal administration) and the brain (intravenous administration) will be presented. We show that a single intravenous dose of dendrimer-drug conjugate, administered after birth to rabbit kits with CP, results in significant improvement in motor function along with decrease in neuroinflammation and oxidative/neuronal injury, followed by improved myelination, by 5 days of age. Application of this approach to designing dendrimer-based targeted therapeutic platforms is being explored in a variety of systemic and neuroinflammation applications.

Upcoming Seminar

February 6: Paul Cisek, University of Montreal  
February 13: King Wai Yau, Johns Hopkins University

<http://www.hopkinsmedicine.org/scical>

<http://www.bme.jhu.edu>

For more information call 410-955-3132