



JOHNS HOPKINS

BIOMEDICAL ENGINEERING



Monday March 2, 2009, 1:00 PM, Clark 110

Teleconferenced to Traylor 709

Light lunch will be provided at 12:15 in Clark 110



Neural Tissue Engineering Strategies

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Hosted by Hai-Quan Mao

Abstract We are focused on promoting regeneration in the central nervous system after traumatic injury, such as after spinal cord injury. In order to overcome the devastation associated with spinal cord injury, one must consider both limiting the neural degeneration that occurs during secondary injury and promoting regeneration. We are pursuing two strategies for spinal cord injury repair which reflect the type of injury: (1) an injectable delivery strategy for the compressed (or crushed) spinal cord where factors that promote tissue sparing are delivered; and (2) an entubulation strategy for the transected (or severed) spinal cord where regenerative strategies are followed. For the injectable delivery strategy, we have demonstrated the safety and therapeutic benefit of injecting a physical blend of hyaluronan/methyl cellulose alone [1] in the subarachnoid (or intrathecal) space. Importantly, we have observed additional neural sparing with local and sustained delivery erythropoietin from this injectable hydrogel [2]. For the entubulation strategy, when neural stem/progenitor cells were implanted in the spinal cord within chitosan tubes, they survived well after implantation and demonstrated some regenerative capacity [3,4]. To control differentiation temporally, the tubes were designed to include microspheres in the wall [5].

- [1] Gupta D; Tator CH; Shoichet MS. 2006 Fast-gelling injectable blend of hyaluronan and methylcellulose for intrathecal, localized drug delivery to the injured spinal cord *Biomaterials*, 27: 2370-2379
- [2] Kang, C.E.; Poon, P.C.; Tator, C.H.; Shoichet, M.S. 2007 A new paradigm for local and sustained release of therapeutic molecules to the injured spinal cord for neuroprotection and tissue repair *Tissue Engineering*, in press
- [3] Zahir, T.; Nomura, H.; Guo, X.D.; Kim, H.; Tator, C.H.; Morshead, C.M.; Shoichet, M.S. 2008 Bioengineering Neural Stem/Progenitor Cell-Coated Tubes for Spinal Cord Injury Repair *Cell Transplantation*, 17: 245-54
- [4] Nomura, H.; Zahir, T.; Baradie, B.; Kim, H.; Katayama, Y.; Kalbatski, I.; Morshead, C.M.; Shoichet, M.S.; Tator, C.H. 2008 Chitosan Channels Promote Survival of Transplanted Neural Stem/Progenitor Cells *Tissue Engineering*, Epub ahead of print; DOI: 10.1089/ten.tea.2007.0349
- [5] Kim, H.; Tator, C.H.; Shoichet, M.S. 2008 Design of Protein-Releasing Chitosan Channels *Biotechnology Progress*, 24: 932-37.

Upcoming Seminar:

March 9: Andy Greene, Medical College of Wisconsin
<http://www.hopkinsmedicine.org/ibbs/news/events.html>
<http://www.hopkinsmedicine.org/scical>

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