Seminar

CENTER FOR ADAPTIVE NEURAL SYSTEMS

IRA A. FULTON SCHOOLS OF ENGINEERING

Patterns of Rho and Rac Activation: Implications for Axon Regeneration

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Abstract: Full recovery following traumatic injury to the central nervous system would best be realized by strategies to encourage axon regeneration and guidance back to appropriate targets. Axon growth and guidance are directed, in large part, by actin cytoskeletal rearrangements in neuronal growth, processes regulated by the Rho family of guanine nucleotide triphosphatases (GTPases). In general, activation of Rac1 is associated with increases axon growth, while activation of RhoA is associated with growth cone stalling and retraction. However, RhoA and Rac1 activation is not independently regulated. Thus, we are interested in how spatial and temporal patterns of RhoA and Rac1 activation lead to differential regulation of actin dynamics through regulation of complexes of actin binding proteins that direct actin polymerization. Using a pharmacological approach, we have shown that Rho GTPase activation is regulated differently in growth cones, an effect masked when assessing Rho GTPase activation in whole cells. Substances that promote neurite outgrowth in cell models activate both RhoA and Rac1 in growth cones and increase the association of proteins that regulate actin polymerization. Recent evidence indicates that differential regulation of Rho GTPase activity may be partially regulated by prenylation. Ongoing studies are assessing the mechanisms involved in directing axon growth. In addition, we are beginning to explore methods to manipulate axon growth and guidance through computer modeling and manipulation using magnetically-responsive nanosphere hydrogels. Together, our biochemical data and nanomaterials approach may lead to a system with the potential to manipulate axon growth and guidance, and possible facilitate axon regeneration in a combinatorial treatment strategy for traumatic brain and spinal cord injury.

Biography: Dr. Hynds received her doctoral degree in Pathobiology from Ohio State University and was a National Institutes of Health NRSA Postdoctoral Fellow in Neuroscience at University of Kentucky. She was a recipient of the Texas Woman's University Chancellor's Research Fellow Award as well as the Universities' Favorite Faculty Award. She has an active research program in cellular & molecular neuroscience directed towards understanding mechanisms for axonal growth after trauma. More recently she has started exploring the use of nanomaterials to promote this growth. Denton, TX. Her res

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