Undergraduate Research Symposium May 17, 2013 Mary Gates Hall

Online Proceedings

POSTER SESSION 4

MGH 241, Easel 164

4:15 PM to 5:45 PM

Effects of Synuclein Gene Knock-Out on Manganese Toxicity in Astrocytes

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Howard Hughes Scholar, Initiative for Maximizing Student Development Scholar
Mentor: Jing Zhang, Pathology
Mentor: Hayley Mattison, Pathology

Manganism, a movement disorder characterized by neuronal death in the basal ganglia and symptomatology similar to Parkinson's disease, has been shown to involve manganese-mediated increase of toxic reactive oxygen species (ROS) production in mitochondria. The protein alpha-synuclein, a product of the SNCA gene, has been implicated in glial and neuronal degeneration in Parkinson's disease, and preliminary data from our laboratory suggests that removal of alpha-synuclein from astrocytes confers some protection against ROS toxicity. Astrocytic hydrogen peroxide metabolism has been shown to produce ROS capable of damaging a variety of cellular macromolecules. The present study seeks to compare the effectiveness of toxicant attenuation in SNCA knock-out and wild type astrocytes in response to hydrogen peroxide after gradated 24-hour manganese pre-treatments. Calcium imaging with fluo-4 dye will be performed to measure astrocytic calcium by quantifying the amplitudes and durations of induced calcium waves, known to form an important mechanism of astrocytic communication, after addition of hydrogen peroxide. Based on previous studies, we predict that increased manganese dosages will correlate with elevated calcium wave amplitudes in both SNCA knock-out and control cultures. We further predict significantly lower calcium wave amplitudes in wild type cultures after each manganese treatment.

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Commons East, Easel 69

4:15 PM to 5:45 PM

***In vitro* Co-Culture of Human Skin Cells on Natural Polymer-Based Scaffold as Skin Graft**

Samara Kate (Sam) Sytsma, Senior, Materials Science & Engineering
Mentor: Miqin Zhang, Materials Science & Engineering
Mentor: ChingTing Tsao, MSE

Tissue engineered skin is a candidate for skin therapies since detrimental wounds require replacement of both the epidermal and dermal layers. For successful replacements, it is important to mimic the skin structure consisting of two layers: a top epidermis layer with a dermis layer beneath, which is made up of keratinocytes and fibroblasts respectively. In the present study, we developed the skin graft by seeding the two types of skin cells, keratinocytes (HeCat) and fibroblasts (hFF), on opposite sides of a porous, biodegradable, and biocompatible 3D natural polymer-based scaffold. The skin graft was investigated by using Alamar Blue Assay, Histology, and SEM. The results showed that (1) the HeCat and hFF proliferated better in co-culture on the scaffold, (2) HeCat forms differentiate into 5 layers, compared with control. This infers that the 3D structure of the scaffold not only acts as a mechanically sufficient substrate for cells to grow and receive nutrients, but also creates a good environment for signaling between the two types of skin cells. These findings indicate that the integration of a natural polymer-based scaffold with co-cultured HeCat and hFF *in vitro* can be used for a living skin graft *in vivo*.

POSTER SESSION 4

Commons East, Easel 70

4:15 PM to 5:45 PM

Multifunctional Nanoprobe for Targeting Dopamine Transporter in the Brain

Solyvattey Malai, Senior, Bioengineering
Mentor: Miqin Zhang, Materials Science & Engineering

Dopamine (DA) modulation is important in treating neurological disorders such as Parkinson's disease. Available methods fail to deliver DA into the brain due to its inability to cross the blood brain barrier (BBB). Attempts have been made to overcome this limitation, such as the development of L-DOPA. Despite its ability to cross the BBB, the pro-drug still causes many unwanted side effects. The demand for new DA delivery led to the development of my DA nanoprobe.

This newly designed nanoprobe is modified to cross the BBB and can be safely uptake into the brain. The addition of a fluorophore allows for *in vitro* detection while the iron oxide core allows for *in vivo* real-time magnetic resonance (MR) imaging. The ability for the DA nanoprobe to cross the BBB and to be detected through optical/MR imaging provides new applications to many diagnostics and therapeutics of central nervous system disorder.