

WINTER 2004
F21 C/Food Science & Engineering Unit
SEMINAR SERIES

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TITLE: **INTEGRATING IMMOBILIZED CELL REACTORS WITH MICROCHIP-BASED ANALYSIS SYSTEMS TO STUDY DISEASE**

ABSTRACT: To fully understand the mechanisms for disease onset, new analytical tools are needed. Ideally, such an analytical system allows one to closely mimic the in vivo system while also enabling the analysis of cell constituents and products. An example of a disease that requires the development of new analytical tools to fully understand the mechanisms for its onset is Parkinson's disease. Recent evidence has shown that nitric oxide may play a role in the degeneration of dopaminergic neurons during the development of Parkinson's disease. Since understanding these mechanisms at the molecular level is very difficult to achieve in vivo, cell culture models are usually employed. An ideal situation is to develop an in vitro cell culture system that mimics an in vivo system by allowing the cells to differentiate in a three-dimensional format and allow intracellular neuronal activity to be monitored via quantitative identification of the molecules involved in those cell communications. As a first step towards such a model, a microchip-based approach and PC 12 cells have been utilized. The PC 12 cells are immobilized in poly(dimethylsiloxane)-based microchannels using a new chip-based cell culturing technique. Optimization of the cell immobilization conditions will be detailed. The bioresponsive nature of the immobilized cells will be demonstrated by amperometric detection of the neurotransmitters (dopamine and norepinephrine) released by the cells upon stimulation with calcium. In addition, work towards developing a microchip-based capillary electrophoresis (CE) system with amperometric detection to separate and detect the released neurotransmitters will be discussed. This involves evaluation of a palladium decoupling system and a new method of fabricating carbon microelectrodes. Finally, studies involving coupling the cell reactor to microchip CE will be described, as will the use of these devices to study the mechanisms leading to dopaminergic degeneration in PC 12 cells by nitric oxide. In addition to the above, work towards developing a microchip-based blood brain barrier mimic will also be described.

Tuesday, December 7, 2004, 4:00pm, AG ENGR Bldg. 105

Refreshments Will Be Served