## Research Assignment - 2009

Title of research assignment

# Toxicity Evaluation of Novel Neural Implant Coatings


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Research abstract

A major focus area of our research is the study of cell behavior on different types of surfaces. This project will investigate the toxicity of novel protective coatings that are being developed for neurological implants. These implants are a special class of prosthetic devices that are under development for the treatment of various neurological disorders (such as stroke, paralysis, and Parkinson's disease). These prostheses are small, silicon-based integrated circuit devices that can send and receive electrical signals to and from neurons in the central nervous system. An important challenge in the design of these implants is the protection of the electronic circuitry from the ambient body environment. Another important design consideration is the response of the human body to these coatings. Materials that are known to be biocompatible in one form may be toxic in another form, so just considering molecular structure is not sufficient; a rigorous method of testing toxicity at the cellular level is required. An additional advantage of such a method is that material samples can be tested quickly and with small numbers of cells before implantation in animals, a process which is considerably more complex and expensive. In a collaborative effort with a local company that is manufacturing the protective coatings, we will design methods to determine how nerve cells respond to these coatings. This work will involve designing appropriate test methodologies and performing the toxicity tests over the duration of the project period.


Research activities/experience

This project will involve studying the response of commercially available nerve cells to novel materials being considered as prospective coating materials for neural implants. All project-related activities will be carried out in the Biological Surface Engineering & Microfluidics Laboratory at Northeastern University. The activities will initially involve

determining how toxicity should be assessed, that is after nerve cells are placed on a test surface, how should their response be detected and evaluated. This project will involve the use of optical and fluorescence microscopy and sample evaluation over periods of hours and days. Participants will gain an understanding of what toxicity means in the context of implanted materials, how toxicity is evaluated and toxicity is affected by different materials and surfaces. Practical laboratory experience in cell culture and microscopy will be an important part of the project.

Expectations of RET

Participants will be expected to show creativity in designing and modifying the toxicity testing experiments. They will also be expected to exercise care and diligence in performing the experiments. Being an experimental project dealing with living cells, a sensitivity to different experimental and environmental parameters will be necessary.

Special skills or interests that would help a RET participant with this assignment (i.e., an interest in physics, experience with specific laboratory equipment, etc.)

Familiarity with cell biology; experience with microscopy and/or cell culture.

Lab safety/issues unique to this laboratory. A general Lab Safety Overview will be presented by Environment Health and Safety to both RET and YSP participants prior to the beginning of lab assignments.

Material samples will be small and non-hazardous. No hazardous chemicals will be used. Basic biosafety precautions should be taken. Additional biosafety training will be provided in-house to supplement the training provided by the Environmental Health & Safety Office.

Suggested literature to be reviewed prior to beginning this research assignment.

"Neuroprosthetics: Theory and Practice" by Kenneth Horch and Gurpreet Dhillon

Research/Lab Summer Hours 9:00 a.m. – 4:00 p.m. ☒ Monday through Thursday ☐ Monday through Friday

Scheduled Research/Lab Meetings : p.m. – : p.m. ☐ Daily ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☒ Friday ☒ To be determined

Lab/research project URL

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