University of Victoria | Graduate Studies

Notice of the Final Oral Examination
for the Degree of Doctor of Philosophy

of

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BSc (Monterrey Institute of Technology and Higher Education, 2015)

"Novel Techniques for Engineering Neural Tissue Using Human Induced Pluripotent Stem Cells"

Department of Mechanical Engineering

Tuesday, November 19, 2019
12:00 P.M.
Engineering Office Wing
Room 430

Supervisory Committee:
Dr. Stephanie Willerth, Department of Mechanical Engineering, University of Victoria (Supervisor)
Dr. Mohsen Akbari, Department of Mechanical Engineering, UVic (Member)
Dr. Alexandre Brolo, Department of Chemistry, UVic (Outside Member)

External Examiner:
Dr. Kyle Lampe, Chemical Engineering, Biomedical Engineering and Neuroscience, University of Virginia

Chair of Oral Examination:
Dr. Lynneth Stuart-Hill, School of Exercise Science, Physical & Health Education, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

Tissue engineering (TE) uses a combination of biomaterial scaffolds, cells, and drug delivery systems (DDS) to create tissues that resemble the human physiology. The goal of TE is to treat, repair, replace, or augment damaged tissues or organs. Bioprinting is a TE technique that consists of fabricating 3D structures using a combination of biomaterials and living cells given in the specifications of a computer-aid-design (CAD) file. Bioprinting technologies can be used for the creation of neural tissues as a drug screening tool for the process of drug discovery and development. Human induced pluripotent stem cells (hiPSCs) can be bioprinted in order to create patient-specific tissues. hiPSCs are reprogrammed somatic cells that have the capability of differentiating into any type of cell, including neuronal subtypes, given the appropriate exposure to morphogens that promote their differentiation. Microspheres are micrometer size particles fabricated from various materials that slowly degrade over time. They can serve as a DDS for the controlled delivery of encapsulated morphogens. This work describes the development and use of novel strategies for engineering neural tissue using a combination of DDS, hiPSCs and bioprinting technologies.