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WISE National Conference 2023: Leaders of Tomorrow

Suzanne M. Wong, MASc Student [1], Sarvnaz Ale Mohammad, BASc Student [1], Isabella Wong, BSc Student [1], Wanda W. Janaeska, BASc Student*[1]

[1] Women in Science and Engineering, University of Toronto, Toronto, Ontario, Canada M5S 0C9

*Corresponding Author: conference.internal@wise.skule.ca

Abstract
Our goal at Women in Science and Engineering – University of Toronto Chapter is to support and empower all women in STEM fields and to help them achieve their full potential as future engineers, entrepreneurs, scientists, and leaders. Since its inception in 1999, the organization has developed into one of the largest and highly regarded campus organizations with over 1500 members to champion gender equity, counter biases, and build confidence in all STEM fields. Our annual National Conference aims to empower and inspire individuals to pursue their passions, explore new opportunities, and to make meaningful, lasting connections. One of the events we hold at the conference is the 3 Minute Thesis (3MT) competition, which challenges undergraduate and graduate delegates to present their research in three minutes with one static slide to a non-specialist audience. This abstract book features the research that some of the 3MT competitors presented at the WISE National Conference 2023.

Keywords: 3MT; competitions; conference; gender equality; STEM; WISE; non-specialist audience

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Conference Abstracts

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3MT Abstracts

Implantable, battery-free, bluetooth-enabled, multiwavelength spectroscopy device for the remote monitoring of physiological biomarkers

Anat Usatinsky, MASc Student [1,2], Daniel Franklin, PhD [1,2]
[1] Institute of Biomedical Engineering, University of Toronto, Toronto, Ontario, Canada M5S 3G9
[2] Ted Rogers Center for Heart Research, Toronto, Ontario, Canada M5G 1M1

Background: Implantable medical devices have yet to utilize modular multiwavelength spectroscopy to its full extent. The need for spectral implants is partly attributed to the innate limitation of light penetration depth. The recent miniaturization of optical sensors and advanced microprocessors enabled the use of spectroscopy systems in compact implantable formats, providing access to vital data.
Methods: Our lab aims to evaluate the use of spectral sensors to monitor physiological biomarkers via a clinically translational implant. We integrated miniaturized spectrometers onto implantable platforms allowing for red and near-infrared LED capabilities. We then demonstrated its functionality in-vitro by analyzing programmable device settings. Devices were encapsulated with a layer of perylene and PDMS and then implanted into rodents.
Results: The data received was analyzed for the detection of slight variations in respiratory and heart rate. By showing that our technology could detect changes in these biomarkers, we demonstrate the use of an implantable, multiwavelength, Bluetooth-operated, RF utilizing, modular-biosensor, in tracking deep tissue hemodynamics.

Conclusion: The novelty of this approach is in providing accessible and modular platforms that improve the duration and resolution of biomarker monitoring. Currently, we are further displaying device application in clinical settings via hypoxia studies and exploring various biomaterial coatings.

A tiled-amplicon sequencing method to target the tomato brown rugose fruit virus in wastewater, crops, and processed tomato and pepper products: A research study

Ria Menon, BSc Student [1], Delaney Nash, PhD [1]
[1] Department of Biology, University of Waterloo, Waterloo, Ontario, Canada N2L3G1

Background: The tomato brown rugose fruit virus (ToBRFV) is a single stranded positive sense RNA virus that has caused a pandemic through the infection of tomato and pepper plants. This virus is able to evade the plant's Tm-22 resistance gene, making it highly pathogenic.
Methods: We extract the RNA from different sources such as wastewater, tomato and pepper crops, and processed tomato products, using the RNeasy Mini Kit. Following this, the RNA is converted to cDNA which then undergoes a PCR reaction using our highly specific tiled-amplicon approach to cover the entire genome. The samples then undergo tagmentation and barcoding to be read on the MiSeq sequencer.
Results: From the sequencing data, we are able to obtain nearly complete genomes of ToBRFV, thereby, identifying mutations and variants of the virus. From sampling wastewater across Ontario, we can see a diverse population of ToBRFV.
Conclusion: Overall, we are able to track its evolution and discover novel lineages. This virus has had a devastating impact on the agricultural industry around the world, causing up to a 70% crop loss. Further research of the ToBRFV can help determine what strains are most pathogenic, prevention and treatment methods, and whether seasonal changes impact the prevalence of certain lineages.

Could an organic compound repair kidney grafts before transplantation?

Slaghaniya Neupane, MSc Student [1,2], Sergi Clotet-Freixas, PhD [1], Maya Allen, MSc Student [2,3], Aninda D. Saha, MSc [1,2], Ana Konvalinka, MD, PhD [1-3]
[1] Institute of Medical Science, University of Toronto, Toronto, Ontario, Canada M5S 1A8
[2] Toronto General Hospital, University Health Network, Toronto, Ontario, Canada M5G 2N2
[3] Department of Laboratory Medicine and Pathobiology, University of Toronto, Ontario, Canada M5S 1A8

Background: Kidney transplantation is the optimal treatment for end-stage kidney disease. Ischemia-reperfusion injury (IRI) harms all transplanted kidneys but can be severe in older kidneys. Normothermic ex vivo kidney reperfusion (NEVKP) is a storage method that results in better graft outcomes. Repairing grafts prior to transplantation would increase the number of viable kidneys, improving graft outcomes. In our previous study, we identified a potential target for repairing kidneys, hepatocyte nuclear factor 4a (HNF4A), a regulator of mitochondrial proteins. The goal of this project is to determine whether a novel HNF4A agonist, N-trans caffeoyltyramine (NCT), protects kidneys from IRI.
Methods: Kidney cells will be treated with NCT, and cell viability and mitochondrial function will be assessed. Mice will be treated with NCT, prior to bilateral IRI and postoperative kidney function/structure will be assessed. Lastly, HNF4A expression will be examined in human kidney grafts with IRI.
Results: Inhibition of HNF4A *in vitro* increases kidney cell death and decreases mitochondrial function.
Conclusion: Based on the preliminary results, HNF4A is important for the metabolic function and viability of kidney cells. If NCT reduces IRI by preserving mitochondrial function, it could be given to patients prior to transplantation to improve graft outcomes.

Conflicts of Interest
The author(s) declare that they have no conflict of interests.

Authors' Contributions
WJ: served as Co-Chair for the conference and gave final approval of the version to be published.
IW: served as Co-Chair for the conference and gave final approval of the version to be published.

SW: served as Co-Director of Competitions for the conference, assisted authors with their abstract submissions, ensured that the authors adhered to correct formatting standards, drafted the conference abstract booklet, and gave final approval of the version to be published.
SA: served as Co-Director of Competitions for the conference and gave final approval of the version to be published

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