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The 15th Annual University of Ottawa Healthcare Symposium: 2024 Pitch-O-Rama Competition

The University of Ottawa Healthcare Symposium (UOHS) 2024 Pitch-O-Rama: Undergraduate Elevator Pitch Research Competition

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Abstract:
The University of Ottawa Healthcare Symposium (UOHS) is a one-day undergraduate health conference aiming to increase awareness of the interdisciplinary field of health. Initially created by undergraduate students fourteen years ago, UOHS has grown to become the University of Ottawa's largest healthcare conference with the goal of providing students with a holistic view of healthcare, fostering networking opportunities and encouraging the exploration of novel health disciplines to support their professional endeavors. The 2024 UOHS conference was held on January 27th, 2024, at 55 Laurier Avenue East in Ottawa. This year's conference theme, *iHealthcare*, aimed to prompt attendees to reflect on the transformative impact of technological innovations on patient care, diagnostics, and healthcare delivery. As a cherished tradition, the 2024 UOHS conference hosted *Pitch-O-Rama*, an Elevator Pitch Competition blending creativity with research innovation. Participants crafted and orally presented innovative research abstracts using slideshows. Participants were judged by a specially invited panel based on clarity, engagement, relevance to society, solving a knowledge gap worth funding, and creativity in presentation. This book will showcase the works of the winners and honorable mentions of the 2024 Pitch-O-Rama competition. For additional details about UOHS, please visit UOHS's website: https://www.uohs-csuo.com/.

Keywords: undergraduate research; pre-fertilization RT-qPCR testing; diabetes, virtual reality interventions, combined drug therapy, chitosans

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Conference Abstracts

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Top Five UOHS 2024 Pitch-O-Rama Abstracts

Pre-fertilization RT-qPCR Testing for Trisomy 13 Using miR-15 and miR-16 Primers

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Current prenatal genetic tests often induce financial, emotional, and physical strain on expecting families. Therapeutic termination of pregnancy (TTP) and chromosome abnormalities in newborns can be prevented if testing was conducted pre-fertilization on parental gametes for germ-cell line defects that increase the risk of genetic abnormalities in fetuses. Trisomy 13 is a particularly lethal chromosomal aneuploidy caused by nondisjunction in germ-cells. Previous research indicates that RT-qPCR testing is an efficient and cost-effective method post-fertilization to detect genetic abnormalities. This study seeks to explore the effectiveness of an RT-qPCR diagnosis pre-fertilization for trisomy 13 using primers designed to anneal to Chromosome 13-specific microRNA-15 and microRNA-16 strands. An RT-qPCR test will be conducted on sperm cell samples previously diagnosed with a chromosome 13 aneuploidy and sequence-specific fluorescent probes on the primers will quantify trisomic patterns via curves read by fluorometers. A positive control consisting of purified miR-15 and miR-16 sequences will indicate the efficacy of primer annealing. A no-template negative control omitting miR-15 and miR-16 will be employed to determine primer accuracy, and a minus reverse transcriptase negative control will test for RNA contamination. PCR thermometers will monitor temperatures and the cell count per sample will be regulated using hemocytometers. Using specific miR-15 and miR-16 primers, RT-qPCR of germ-line cells has high potential for trisomy 13 detection pre-conception, which could significantly reduce the emotional, financial, and ethical burden of conventional testing.

Immunometabolics and Type 1 Diabetes: A Novel Method for Immunosuppressant Screening

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Type 1 diabetes is a significant health concern as it is an autoimmune condition affecting millions worldwide, necessitating lifelong insulin therapy, and its complex interplay of genetic and environmental factors underscores the ongoing need for research and therapeutic advancements. The link between diabetes and the immune system lies in autoimmune mechanisms, where in type 1 diabetes, the immune system mistakenly attacks and destroys insulin-producing beta cells in the pancreas, leading to insulin deficiency and dysregulation of blood sugar levels. In general, immune cell activation is tied to changes in metabolic activity. Dependence on different pathways such as glycolysis or oxidative phosphorylation is directly tied to activation of immune cells. My project objective is to profile the metabolic activity of T cells from mice following treatment of clinically available immunosuppressants such as anti-thymocyte globulin. T cells will be harvested from nonobese diabetic (NOD) mice, a common T1D mouse model. Through a novel method developed in France, Single Cell Energetic Metabolism by Profiling Translation Inhibition (SCENITH) will be used to complete this objective. The SCENITH protocol uses flow-cytometry to measure the degree of protein translation. Therefore, the method estimates metabolic activity through a measure of protein translation. SCENITH allows for a single-cell level quantitative measure of dependence on glycolysis and oxidative phosphorylation. This screen will serve as a method to identify the role of immunosuppressive therapies on the metabolic activity of T cells. Changes of metabolic activity that indicate dampening of proinflammatory responses within T1D conditions will help identify effective immunotherapies.

Enhancing Pediatric Mental Health Care - Integrating Virtual Reality Interventions for Children with Disabilities

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Introduction: In pediatric mental health care, traditional therapies often fall short in effectively addressing the unique challenges faced by children with disabilities. This study explores the potential of Virtual Reality (VR) technology as an innovative approach in pediatric mental health interventions. It aims to assess how VR-based therapy, known for its immersive and interactive qualities, can improve cognitive and emotional well-being in children with physical and developmental disabilities, aiming to offer a compelling alternative to conventional therapeutic methods.
Methods: This study uses a mixed-methods approach involving 100 pediatric participants selected based on inclusive criteria encompassing a wide range of disabilities. The intervention group will participate in specially designed VR sessions twice weekly for three months. These sessions will include tailored scenarios aimed at boosting confidence, reducing anxiety, and

improving social skills. Outcomes will be measured using established psychological scales along with qualitative feedback from both children and caregivers. For comparative analysis, a control group will receive standard therapeutic care.
Results: It is anticipated that the children in the VR group will demonstrate significant improvements in emotional regulation and social skills, underlining the potential of VR as a powerful, non-invasive tool in pediatric mental health care practices.
Conclusion: This research aims to revolutionize pediatric mental health interventions by offering VR as an adaptable, engaging therapeutic alternative more aligned with children's needs. The anticipated findings could significantly impact the technological advancement of healthcare solutions for children with disabilities.

Combined Drug Therapy: Amiloride and Pioglitazone to Treat Type- 2 Diabetes

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Patients with diabetes are statistically four times more likely to die of heart disease complications. Pioglitazone is an FDA-approved drug known for increasing cardiorespiratory fitness (CRF) in patients with type 2 diabetes (T2D), a common risk factor in T2D medications. However, this drug has been found to cause renal water retention, and the mechanism underlying this side effect is not clearly understood. Therefore, it is crucial to develop an alternative low-risk medication for insulin-resistant patients at risk of cardiovascular diseases. On the other hand, Amiloride is a drug known to decrease renal water retention without altering the glucose-lowering mechanisms of T2D drugs. Therefore, we hypothesize that Amiloride will reduce renal water retention caused by Pioglitazone and increase CRF. Based on previous studies, we will use T2D db/db mouse model. The negative control group will consist of mice group injected with saline, the controlled group with Pioglitazone, and the experimental group with Pioglitazone and Amiloride. We will monitor blood glucose levels, hematocrit concentrations, and CRF markers like heart rate, lactate levels, and VO2 peaks. Our predicted results will show that the combined drug therapy preserves Pioglitazone's glucose-lowering and CRF enhancing roles while reducing renal water retention. Our overall aim is to develop a combined drug therapy that lowers blood glucose levels, enhances CRF, and minimizes renal water retention. Our study aims to noticeably improve T2D treatment, furthering investigations on the efficacy of combined drug therapy in patients.

Development of a Novel Synergistic Chitosan-Statin Combination Therapy for Hypercholesterolemia: Mitigating Hepatoxicity, Enhancing Bioavailability, and Addressing Environmental Sustainability using Chitosans Derived from Fungal Fermentation

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Hypercholesterolemia is a medical condition characterized by elevated levels of low-density lipoprotein (LDL) cholesterol in the blood. It represents a prevalent health concern, with a substantial portion of the global population affected. The risks associated with hypercholesterolemia include an increased likelihood of developing cardiovascular diseases such as heart disease, stroke, and peripheral vascular disease due to the accumulation of LDL cholesterol in the arteries. Current statin treatments effectively lower cholesterol but present challenges such as long-term toxicity and adverse hepatic effects. This research proposes a novel combinative therapy utilizing fungal-derived chitosans, bioactive polymers, and statins to mitigate hepatotoxicity and enhance treatment outcomes. Leveraging chitosan's polycationic structure and membrane-permeabilizing characteristics, the study hypothesizes that a parallel administration with statins will synergistically reduce required statin doses, thereby improving efficacy. Extraction of chitosans from fungi via fermentation processes presents a sustainable and reliable alternative to traditional methods reliant on seasonal crustacean sources. Through a fungal fermentation process utilizing strains like R. oryzae, eliminating the need for intensive demineralization typically associated with crustacean-derived chitosans, chitosans can be extracted. In the 8-week in vivo study on C57BL/6 mice, metabolic tests and lipid profile assessments will be conducted after a 4-week control period with a high-cholesterol diet. The mice will then be distributed into treatment groups, receiving statins, chitosans, or a combination, with dosages administered through oral gavage to finally assess the potential of a synergistic chitosan-statin combination therapy for hypercholesterolemia in mitigating the challenges posed hepatotoxicity for patients with preexisting conditions, improving end-care outcomes.

Conflicts of Interest
The following authors Rahima Hasmani and Niyoosha Tabassum declare that they have no conflict of interests.

Authors' Contributions
NT: directed communication between judges and elevator pitch competition competitors, served as liaison author with URNSCT journal, served in the planning committee for the conference, drafted the conference abstract booklet and finalized the format.
RH: completed written abstract for the conference book, provided final approval of the version to be published, collaborated with the UOHS team to organize the conference, and reviewed the submitted abstracts of finalists.

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