

## 2022-2023 Multidisciplinary Health Research Experience (MHRE) Research Pitch Competition



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### Abstract

The Multidisciplinary Health Research Experience (MHRE) Research Pitch Competition 2022-2023 was an inaugural competition hosted at the University of Manitoba, aimed to engage undergraduate students in research thinking and innovation. In this competition, students were offered the opportunity to form teams of 1-3 people, with a graduate student acting as a research mentor. As a team, members collaborated on designing a research proposal, presented as an abstract and poster, to address an issue of their choice that was related to the competition theme. Moreover, the competition theme for this year centred on 'limiting the spread of infectious diseases during a humanitarian crisis'. Students were encouraged to explore different fields of STEM that interested them for their research proposal. The competition received over 30 team applications spanning various disciplines such as STEM, statistics, biology, microbiology, epidemiology, public health, community health, medicine, social sciences, engineering, and more. The following abstracts feature the top submissions evaluated by both graduate students and professors.

**Keywords:** infectious diseases; STEM; engagement; research mentorship; knowledge translation; knowledge exchange; science communication

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### Conference Abstracts

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### Competition Abstracts (A-Z)

#### **A multifaceted therapeutic recreation intervention plan: Analyzing and managing the impact of COVID-19 on mental health among long term care residents**

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Introduction: The COVID-19 pandemic has impacted the populations worldwide, significantly affecting the long-term care (LTC) residents. Data by Statistics Canada implies higher COVID 19 death rate among the population 60+ therefore conceptualizing it as a "gero-pandemic". COVID-19 is seen to have effects on mental health due to social isolation and fear

of infection which eventually leads to an increase in anxiety, depression, and overall decline in mental health. This therapeutic intervention plan aims to focus on the impact and management of COVID-19 on the mental health among LTC residents.

Proposed methodology: To be executed among the 30 LTC residents over the span of 6 months conducted by certified TR professionals, divided in 3 phases.

Phase 1- Assessment through structured interview and use of tools i.e., MDS-RAI (Minimum Data Set Resident Assessment Instrument), Generalized Anxiety Disorder and Geriatric Depression Scale for evaluation.

Phase 2- A multifaceted intervention divided into 2 components.

Awareness plan focuses on mental health education, positive aging, counselling, support groups, and disease awareness and prevention through active communication among the participants.

Action plan includes use of a two-way exchange model which uses volunteers from university level, trained by the TR professionals who can engage in TR activities with the LTC participants through photo-voicing, art therapy, meditation, technology bridging, companionship.

Phase 3- Participants will be reassessed using tools from Phase-1 and the results will be compared for pre- and post-intervention changes in the variables (anxiety, depression, loneliness, and fear of contraction).

Expected Results: Expected to display decrease in the feeling of isolation, anxiety, depression, fear, and an increase in satisfaction and mental health.

Significance and Community Engagement: The community engagement would be reflected through the two-way exchange model between younger population and the LTC residents which will bridge the gap through intergenerational learning, transition of experiences and knowledge. This will help promote healthy aging and awareness towards geriatric research.

### **A non-antibiotic approach to treat the outbreak of vibrio cholera in Syrian refugee camps in Lebanon**

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Last year, Lebanon issued a state of emergency in response to the cholera outbreak that primarily affected Syrian refugee camps. Syrian refugees, who have been forced to leave their homes due to almost 12 years of war, struggle to find clean water. Therefore, they are susceptible to cholera (*Vibrio cholera*) infections. *Vibrio cholera* infections are associated with numerous symptoms ranging from mild to fatal. Antibiotics are currently used in cholera treatments, but most *V. cholera* species have developed resistance to antibiotics. The purpose of this study is to create another cheap and accessible approach to the treatment of cholera without reliance on antibiotics. In the current study, we hypothesised the possibility of treating cholera with a conjugated form of linoleic acid combined with engineered probiotic *Lactococcus lactis*. Linoleic acid can inhibit toxin production, which is necessary to reduce *V. cholera*'s ability to become virulent. The monoclonal antibody ZAC-3 from engineered *L. lactis* inhibits the motility of *V. cholera* to colonize the small intestine and cause infection. By using recombinant DNA technologies to reconstruct gene fragments and obtain ZAC-3, the ZAC-3 antibody is engineered to be exhibited on the probiotic surface and inhibit the pathogenic activity of cholera. A cost analysis assures the affordable price and thus, health organisations may offer our dietary supplements as part of their food donations. Also, the probiotic nature of our treatment is expected not to trigger an immune reaction. Therefore, the development of this supplement not only provides a solution for slowing down the spread of antibiotic resistance, but also sheds light on new approaches for treating associated bacterial microorganisms. A QR code linked to an Instagram page with information about our treatment will be posted everywhere for affected people and health organizations to be aware of our innovative non-antibiotic approach and its uses.

### **Barriers and strategies for diagnosis of human papillomavirus infection in indigenous communities in Manitoba**

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Indigenous communities in Canada experience significantly higher rates of human papillomavirus (HPV) infection and cervical cancer compared to non-Indigenous communities (Jiang et al., 2013). Barriers to receiving regular screening include lack of access to care and unpleasantness of receiving a traditional Papanicolaou (Pap) smear (Suk et al., 2022). Individuals with a uterus prefer to do self-collected tests due to the vulnerable nature of a Pap smear. The barriers in Indigenous

communities are compounded by the lasting effects of colonization, leading to deeply-rooted systemic racism, and therefore, a mistrust in the healthcare system correlating with lower testing rates (Henderson et al., 2017). In this study, we propose that implementing the non-invasive, urine self-testing method of HPV screening published by Leeman et al. in 2017 will increase the rates of HPV detection in Indigenous communities. We will establish urine self-testing clinics in 50 of these communities in Manitoba and compare the rates of HPV detection to rates of detection by traditional Pap smear clinics. Finding that the urine self-testing clinics are able to detect more HPV infections will pave the way for a broad adoption of this testing strategy. This would allow earlier treatment of HPV infections and consequently, decreased rates of cervical cancer in Indigenous communities. Collaboration with Indigenous communities would be instrumental in implementing this process. Social media platforms such as TikTok, Facebook and Instagram are ways to easily spread information, and can be used as a tool to advertise the ease of urine self-testing for HPV. This could be one step toward reconciliation between the Indigenous peoples and the Canadian healthcare system.

### **Comparing post-COVID-19 pandemic stress in Manitobans living with HIV before and after attending a group mindfulness-based stress reduction program**

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The 2019 coronavirus disease (COVID-19) is associated with an increase in stress and anxiety levels in the general population (Yıldırım & Solmaz, 2022). As the world slowly emerges from COVID-19, individuals living with human immunodeficiency virus (ILWH) are reporting increased stress due to lack of social interaction, and decreased access to antiretroviral therapy (Lopez-Matos et al., 2022). This study seeks to examine the effects of a group mindfulness-based stress reduction (MBSR) program on post-COVID-19 pandemic stress levels in ILWH. MBSR programs have been shown to decrease stress and increase healthy mindfulness-based coping mechanisms in a variety of populations through exercises that increase bodily awareness, self-acceptance, and emotional regulation (Carmody et al., 2008; Lwi et al., 2022; Martins, 2014). Stratified random sampling is used to gather a total population of 40 individuals from four different community health centers in Winnipeg and separate them into two groups: 20 ILWH, and 20 ILWOH. Individuals will complete a stress survey adapted from the Perceived Stress Survey (Cohen et al., 1983) to assess stress levels pre- and post-program. Each 45-minute session will begin with a 15-minute discussion about stress and mental health, and then will introduce a new mindfulness technique to be tried as a group. It is hypothesized that attending an eight-week group MBSR program will decrease post-COVID-19 perceived stress levels in ILWH. It is expected the results show that differences in pre-program scores are higher than post-program scores for both ILWH and ILWOH. This suggests that attending a group MBSR program decreases stress in participants regardless of HIV status. While the target audience of these findings are ILWH under post-COVID-19 pandemic stress, this program could be generalizable to the general population through implementation of group MBSR programs at community health clinics.

### **Yemen malnutrition crisis: Detection of bacterial pneumonia infections in cases of child malnutrition**

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Due to conflict and insufficient social services, Yemen is facing a food insecurity crisis. Immunosuppression is highly implicated in long-term malnutrition and can leave children under five susceptible to acute respiratory infection (ARI) (Rodriguez et al., 2011). Advanced diagnostic screening is often inaccessible in resource-limited settings, making broad-spectrum antibiotic (ABX) use the most viable option in many cases. However, the wide-spread use of broad-spectrum ABXs risks the development of antibiotic-resistant (ABR) bacteria. The purpose of this research is to provide a selective, cost-effective, and field-deployable microfluidic sedimentation-based immunoassay (MSI) to diagnose ARI based on design principles described in current literature (Phaneuf et al., 2016; Schaff and Sommer, 2011; Shi et al., 2021). This will allow doctors to prescribe specific narrow-spectrum ABXs over broad-spectrum to combat ABR. This study will use sputum samples from three-hundred Yemeni children under five with protein-calorie malnutrition. Using bacterial culture techniques as a diagnostic control, we will determine the efficacy of our device in identifying *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Staphylococcus aureus*, three major causative agents of bacterial pneumonia. Results will be analyzed using confusion matrices with the sensitivity and specificity metrics for both techniques. We expect MSI to identify target antigens

in malnourished children with ARI and provide a negative test result in those without ARI. Additionally, we anticipate that the MSI will offer a cost-effective solution to insufficient diagnostics in resource-poor nations while maintaining the sensitivity of alternate clinical diagnostic tests like bacterial culture-based identification. The results will be used to create presentations in collaboration with the Yemen Red Crescent Society to seek aid from biomedical companies for the device production and to provide education for parents of malnourished Yemeni children about screening options for ARI to inhibit the development of ABR.

### Conflicts of Interest

The authors declare that they have no conflict of interests.

### Authors' Contributions

TL: led the development and implementation of the MHRE Pitch Competition, and gave final approval of the version to be published.

JF: conceptualized the competition theme, directed the evaluation process, and gave final approval of the version to be published.

KM: created the evaluation rubric, provided mentorship resources, and gave final approval of the version to be published.

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