COVID-19 – FUNDED PROJECTS

Design and Fabrication of Respirator Cap and Seal

Funder: SONAMI
Partner: Bluewater Health (BWH)
Principal Investigator: Simon Langford
Department: Research & Innovation – Lambton Manufacturing Innovation Centre (LMIC)

Description: Since the beginning of the COVID-19 pandemic, there has been a critical shortage of medical supplies (facemasks, face shields, testing equipment, etc.), all of which are vital in the fight against COVID-19. The College's Lambton Manufacturing Innovation Centre (LMIC) has been working with Bluewater Health to help address this shortage by using LMIC's 3D printing capabilities to produce mask caps and filter caps for PPE half masks and elastic straps for N95 masks to ease irritation for workers. All of these items are required by BWH to protect the hospital staff and patients during the pandemic.

To reduce the required filters necessary for the half masks, a cap with a gasket seals the unused mask filter location. The caps went through eight iterations to optimize the design. Caps were also developed for the filters so that when not in use, the filters are capped, kept clean from any particulates and are able to be re-used. Elastic holders were also produced to be used with regular masks to help prevent ear irritation.

Microalgae as an Antigen Source for a Novel Tandem Point of Care Serological Assay for SARS-CoV-2

Funder: NSERC
Partner: Suncor Sarnia Refinery & Western University
Principal Investigator: Alexa Galbraith
Department: Research & Innovation – Bio-Industrial Process Research Centre (BPRC)

Description: In order to move past "stay at home" orders, testing on a massive scale is required to properly track the COVID-19 virus. Additionally, evidence suggests that the virus spreads through asymptomatic persons as well. Therefore, increased testing will be helpful in the large-scale tracking of "carriers."

At the current time, we do not have the ability for population-wide testing due to a limited reagent supply. Serological testing can identify people who have been infected and become immune by detecting antibodies against SARS-CoV-2 spike protein. This collaborative project between Lambton College, Western University and Suncor Sarnia Refinery proposes to produce SARS-CoV-2 spike protein using the microalgae Phaeodactylum tricornutum. P. tricornutum is an excellent expression system because it can appropriately glycosylate exogenous proteins, it is inexpensive, it has minimal biocontainment requirements, and it is amenable to scaling for the large-scale production needed to combat SARS-CoV-2. In addition to the current pandemic, this method could be rapidly adapted if the spike protein mutates and could be used for future outbreaks of other viruses.

Development of a Safe and Effective COVID-19 Vaccine and Booster Using Linear Covalently Closed DNA Minivectors

Funder: NSERC
Partner: Mediphage Bioceuticals Inc.
Principal Investigator: Baoling Chen, Alexa Galbraith & Samantha Tagliabracci
Department: Research & Innovation – Bio-Industrial Process Research Centre (BPRC) & Industrial Research Chair for Colleges (IRCC)

Description: Mediphage Bioceuticals (MBI) is genetic medicine company developing therapeutics for inherited ocular diseases. Their flagship technology, ministering DNA (msDNA), is a safe and effective gene delivery vector that can be used to cure genetic diseases that have limited, or no treatment options available.

In collaboration with Lambton College, MBI aims to produce a safe and effective vaccine and booster using MBI's linear covalently closed (LCC) DNA minivectors. Previous collaborations between the College and MBI have resulted in the successful optimization of the fermentation and small-scale purification process developed by MBI for production of LCC msDNA. To date, separation of LCC DNA from other SNA species, both by size and topology, has yet to be achieved beyond analytical levels of purification. An efficient and scaled-up approach to generate large-scale msDNA production is required for generation of a commercially viable vaccine.

Successful completion of this project will allow Mediphage to produce the volume of msDNA-VLP necessary to conduct preclinical efficacy testing of in vitro and in vivo models. The success of this study will have colossal impacts for the future of Canadians as a vaccine is necessary to end the COVID-19 global pandemic and allow the Canadian and global economy to begin its recovery.

Hand Sanitizer Production for Rural Ontario Healthcare Facilities and Businesses

Funder: SONAMI
Partner: Refined Fool Brewing Co.
Principal Investigator: Samantha Tagliabracci
Department: Research & Innovation – Lambton Manufacturing Innovation Centre (LMIC)

Description: Hand sanitizer provides significant disinfection and destruction of COVID-19 when soap and water are not immediately available. There is a well-established market for hand sanitizer and there is a need to get supplies to hospitals, doctors' offices, pharmacies, grocery stores and other businesses when they become accessible to the public again.

Due to this need, local brewery Refined Fool Brewing Co. has partnered with Lambton College to produce hand sanitizer based on WHO guidelines for local companies. This project will utilize the large fermentation equipment at the breweries to produce a 20% ethanol by volume solution. This solution is then distilled using Lambton College's distillation unit to 95% ethanol and mixed with hydrogen peroxide and glycerol to produce the hand sanitizer product.

Several batches of the sanitizer have been donated to local organizations to support front line workers including those at Bluewater Health, The Inn of the Good Shepherd, Bluewater Methadone Clinic, Sarnia Police Services, Sarnia Fire Rescue and the Bluewater Bridge Authority.