**List of participating laboratories, Advanced Biomanufacturing Innovations: Biotherapeutics manufacturing stream**

1. Dr. John Bell, Ottawa Hospital Research Institute, Ottawa, jbell@ohri.ca
2. Dr. Jean-Simon Diallo, Ottawa Hospital Research Institute, Ottawa, jsdiallo@ohri.ca
3. Dr. Amine Kamen, Viral Vectors and Vaccines Bioprocessing Group, Department of Bioengineering, McGill University, Montreal, amine.kamen@mcgill.ca
4. Dr. David Latulippe, Bioprocess Automation Lab, Chemical Engineering, McMaster University, Hamilton, latulid@mcmaster.ca
5. Dr. Jennifer Quizi, Biotherapeutics Manufacturing Centre, Ottawa Hospital, Ottawa, jquizi@ohri.ca
6. Dr. Trina Racine, Vaccine Development, Vaccine and Infectious Disease Organization, Saskatoon, trina.racine@usask.ca

**Specific project descriptions:**

Dr. John Bell

Title: "Optimizing and developing biotherapeutic purification processes and quality attribute assays in mRNA-lipid nanoparticle (LNP) manufacturing".

Description: Messenger RNA (mRNA) vaccines are promising biotherapeutics in the treatment of cancer and other diseases. To bring mRNA vaccines from the research setting into clinical trials, the mRNA must be pure and of high quality. The 2026 summer student fellowship will involve 1) the development and optimization of biotherapeutic purification steps, and 2) the development and optimization of molecular biology tests to ensure quality is accurately and precisely measured.

Dr. Jean-Simon Diallo

Title:" Enhancing Upstream Bioprocess Yields for Viral-Vectored Vaccines Using Small-Molecule Viral Sensitizers".

Description: This upstream bioprocess development project explores small-molecule viral sensitizers to increase the yields of viral-vectored vaccines (Ad, LV). The intern will test candidate molecules in producing cell lines and measure impacts on viral vector production. The work will inform improved upstream strategies for vaccine biomanufacturing.

Dr. Amine Kamen

Title: “Optimization of template DNA Cell-Free production for advanced mRNA manufacturing”

Description: Production of high-quality template DNA is major step in mRNA manufacturing. The Rolling Circle Amplification (RCA) is a cell-free method for producing template DNA within hours

instead of days. This project focus on optimizing the RCA method through a Design of Experiments. The intern will assist in assessing the critical process parameters ( DNA polymerase, nucleotides, exonuclease primers, buffers) to maximize the yield of template DNA. The work will be an important contribution to advancing the manufacturing of mRNA vaccines and therapeutics by addressing current critical limitations in term of response-time, access, and cost-effectiveness.

Dr. David Latulippe
Title: "Innovations in Scalable Bioseparation Technology"
Description: This biomanufacturing project aims to develop next-generation analytical tools to monitor critical quality attributes in biotherapeutic production. The intern will perform protein analyses such as gel electrophoresis, mass spectrometry, liquid chromatography, and biolayer interferometry. This project will develop Canada's advanced biomanufacturing capabilities.

Dr. Jennifer Quizi
Title: "Process optimization for the manufacture of cutting edge biotherapeutics for cancer"
Description: The OHRI's Biotherapeutics Manufacturing Centre (BMC) is one of Canada's leading manufacturers of cell and virus-based therapies for use in early phase clinical trials. The 2026 summer studentship will join a team of 40+ highly qualified personnel and meaningfully contribute to the process development of a biologic therapy along its path to GMP production. This will involve being trained to work in a GMP environment, and hands-on training with specialized equipment such as bioreactors, tangential flow filtration and chromatography.

Dr. Trina Racine
Title: **"**Development of a GMP-Compliant Monolithic Chromatography Platform for Plasmid DNA and mRNA Purification"
Description: Specially designed DNA molecules, called plasmid DNA (pDNA) vectors, are an important starting material used to make messenger RNA (mRNA) for vaccines and other therapeutic products. To produce pDNA, bacteria are grown and then broken open to release the DNA. This mixture is then cleaned and purified to remove unwanted bacterial components and other impurities.
A newer type of purification, called monolithic chromatography, has recently been developed to purify both mRNA and the pDNA used to make it. These columns have large channels that allow liquids to flow through easily, enabling fast processing, high product recovery, and gentle handling of the DNA.
Creating a purification method that works at large scale and meets strict quality standards (GMP) is a key step toward producing mRNA efficiently and affordably—for both human and animal health. This work includes developing and validating a chromatography-based method that can separate different forms of pDNA using standard FPLC instruments commonly found in quality control laboratories. Having this "at-line" testing tool will speed up the development and scaling

of the pDNA/mRNA production process and help ensure that the final pDNA/mRNA meets required quality standards.

The intern will assist in the following process:

1. **Fermentation and harvest of bacterial cells.**
2. **Optimization of conditions** to release DNA, proteins, and RNA from *E. coli* cells**.**
3. **Identification of methods to remove impurities**, such as RNA, from the lysed material before introducing crude DNA isoforms into the monolithic columns**.**
4. Identify and optimize the conditions to enhance the purity of the pDNA/mRNA molecules
5. **Development and optimization of UV-absorbance–based assays and electrophoretic methods** to ensure accurate and precise quality assessment of the products**.**