

The immunology laboratory: leading the precision medicine revolution in transplantation and complex immune diseases

Clinical laboratories account for a modest fraction of health care costs yet influence more than 70% of all medical decisions made by health care providers. Clinical laboratory tests support healthcare efficiency by enabling early identification, monitoring, and prevention of disease. Almost half a billion tests are performed in Canada each year, providing critical data for a relatively small expenditure.

Evaluating and implementing advances in technology and diagnostic testing are crucial responsibilities of the clinical laboratory in order to provide cost-efficient, evidence-based and personalized medicine for the growing numbers of patients with complex immune diseases or awaiting transplantation.

The B.C. Immunology Laboratory, with almost 20 personnel, is one of the largest and most advanced in Canada, providing services 24 hours a day, seven days a week to support the stem cell and solid organ transplant programs. It led the introduction of advanced next-generation gene sequencing for precise HLA typing of donors and recipients and performs sophisticated solid-phase and cytometric antibody tests to detect antibodies that could lead to accelerated organ rejection. With its partner autoimmune and hematology sections it performs a broad range of genomic and cytometric testing to identify immune diseases, leukemias and blood diseases, and avoid drug reactions.

The development and evaluation of cutting-edge assays is a major part of our research program, supported by Genome Canada. New approaches include: protein mapping of donors and recipients using structural biology to enable BC to become the first location in the world to introduce epitope-based typing and reduce the risk of rejection; the novel use of revolutionary Nanopore sequencing to obtain rapid and precise HLA typing of donors and recipients; the investigation of T-cell receptor sequencing to detect the earliest signs of the rejection response; and a variety of immune monitoring assays and non-invasive cell-free donor-derived DNA testing to monitor graft health and predict rejection.

Precision diagnostics represents a key paradigm for transplantation and other complex diseases. The role of the Immunology laboratory will be to introduce the advanced, rapid and precise diagnostic tests that will become essential for the successful application of precision medicine in transforming human health in these complex diseases.