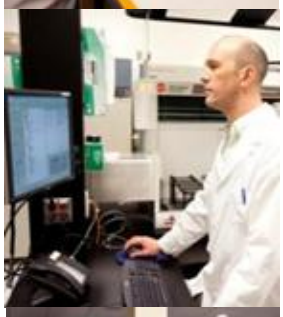

Public Health Agency of Canada

National Microbiology Laboratory

Operational Business Plan 2014-15

Canada

Public Health Agency of Canada | Agence de la santé publique du Canada

NML Operational Business Plan
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MESSAGE FROM THE SCIENTIFIC DIRECTOR GENERAL

Events at NML continue to be busy with responses to outbreaks, training, visitors, and much more happening all the time, along with several recent organizational changes. All of this is in addition to the high-standard diagnostics and world-class research taking place on an ongoing basis throughout the lab. As the saying goes, the only thing constant is change, and for NML this is very true. We keep evolving and improving, expanding and shifting. Flexibility is one of our strengths.

A major change for NML this past year, was one of leadership. After 14 years as the Scientific Director General at NML, Dr. Frank Plummer will take on the role of Special Advisor, reporting to the Deputy Chief Public Health Officer and Associate Deputy Minister. His efforts, vision and leadership have been instrumental in NML's evolution to an internationally recognized institution. While he will be missed at NML, his passion for excellence in science will continue to guide the Agency's future course.

On a sad note, Dr. Runtao He passed away in November 2013. Dr. He was a research scientist in Bloodborne Pathogens and Hepatitis. He was well respected, both a scientist and a supervisor to his staff and students. He will be greatly missed.

This past year saw the official opening of the J.C. Wilt Infectious Diseases Research Centre as staff from the National HIV and Retrovirology Laboratory were welcomed to Winnipeg. This relocation involved tremendous effort on the part of many individuals and their hard work is sincerely appreciated. As we go forward, we expect to see this lab reach its tremendous potential.

Another change effecting NML is the upcoming year is the Treasury Board Secretariat Performance Management Directive. This new process will be more robust, providing a greater opportunity for staff to be recognized for the excellence of their work. It will also allow us to better align our individual objectives with the work of our unit, as outlined in this document, and more broadly, with the priorities of the lab, branch and Agency.

NML will also be working with the Laboratory of Foodborne Zoonoses to realize the vision of One Lab Management. One Lab Management will strengthen laboratory infrastructure to maximize programmatic collaborations and cooperation. This will include a review of governance and processes with respect to laboratory management and a client service framework to support laboratory and centre level engagement

I am pleased to present the eighth annual Operational Business Plan for the Public Health Agency of Canada's National Microbiology Laboratory (NML).

Steven Guercio
Executive Director
A/Scientific Director General
National Microbiology Laboratory
Public Health Agency of Canada

INTRODUCTION

The Public Health Agency of Canada's National Microbiology Laboratory (NML) has a mission to advance human health through laboratory leadership, scientific excellence and public health innovation. NML addresses this mission through the fulfilment of its core functions: Reference and Diagnostic Services; Surveillance; Applied and Discovery Research; Leadership, Training, Network and Capacity Development; , Emergency Preparedness and Outbreak Response; and Program Support, Infrastructure Integrity and Management Oversight. These functions are critical to support the public health system in Canada.

Providing extensive services to Canadians, NML has highly specialized expertise and technology to provide diagnostic tests that are less frequently required, and therefore not available at many frontline or provincial labs, thus creating efficiencies within the overall public health system. The confirmatory testing, subtyping and other investigative work performed at NM contributes to frontline service as well as national surveillance. In addition, staff create a safer world by providing considerable training and leadership to many labs nationally and internationally. From just the little noted here, it is not hard to see how NML's services are critical to the protection of health in Canada.

There are four national laboratory programs that undertake these activities: Bacteriology and Enterics; Viral Diseases; Zoonotic Diseases and Special Pathogens; and National HIV and Retroviology Laboratoires. These four divisions are complemented and supported by other programs and services such as Science Technology Cores and Services; Science Support and Client Services; Scientific Informatics Services; and the Real Property, Safety and Security Division. Each unit from every section, more than 60 in total, has defined its goals and activities for the year in this plan.

At the end of the fiscal year, the annual reports for each section will measure progress against these plans. Taking it a step further, the annual reports for sections offering reference services are subject to periodic peer-review by a Canadian Public Health Laboratory Network (CPHLN) subcommittee. This is part of the organized and strategic approach NML has developed for its planning and reporting activities to ensure they align with the overall priorities of the Agency and meet the requirements of client laboratories.

Much of NML's research is undertaken in collaboration with various partners and at times with the assistance of external funding. This allows leveraging much more work than would be otherwise possible independently. Often, NML provides in-kind contributions of staff, facilities and equipment, allowing resources to be maximized in providing the best services for Canadians and adding the most knowledge possible to the global scientific community. This year will be no exception.

It is in this context that Managers and Directors have defined their goals and activities for the year ahead.

AGENCY AND LABORATORY STRATEGIC FRAMEWORK

Vision and Mission - The vision and mission of the Public Health Agency of Canada are outlined in its strategic plan: Strategic Horizons 2013-2018. NML's own vision and mission provide the basis for NML's annual business and resource planning. While the Agency's strategic plan articulates a multi-year vision, NML re-evaluates its activities annually as part of the business planning cycle to ensure it is able to respond effectively to the needs of Canadians as well as to ministerial and government priorities.

	VISION	MISSION
Public Health Agency of Canada (including the Infectious Disease Prevention and Control Branch)	Healthy Canadians and communities in a healthier world.	To promote and protect the health of Canadians through leadership, partnership, innovation and action in public health.
National Microbiology Laboratory	A world-class organization dedicated to the protection of Canadian and global public health.	Advance human health through laboratory leadership, scientific excellence, and public health innovation.

Agency Five-Year Strategic Plan - The strategic and operational priorities of NML are aligned with the four stated strategic directions of the Agency's Strategic Horizons 2013-2018 strategic plan:

- Strengthened health promotion and disease prevention leadership
- Strengthened public health capacity and science leadership
- Enhanced public health security
- Excellence and innovation in management

IDPC Strategic Plan - The Infectious Disease Prevention and Control Branch (IDPC) has developed a strategic plan to help establish a clear set of priorities for the branch, its laboratories and program centres. The IDPC Strategic Plan will help all areas of the branch deliver on its mandate. The Branch's five strategic goals are:

- developing targeted prevention and control initiatives
- strengthening the national public health system and building capacity
- enhancing national surveillance of infectious diseases
- establishing a comprehensive knowledge translation / communications plan
- strengthening management processes and positioning IDPC for the future

As a branch, IDPC 2014-2015 priorities will include:

- Implementing a Risk-Based Approach to Prevention and Control that focuses on the areas of Pandemics, Antimicrobial Resistance and Emerging and Re-emerging Food-borne and Vector-borne Zoonotic Infectious Disease;

- Transforming Infectious Disease Surveillance to actively transform the Branch's surveillance programs to meet the demands of the 21st century public and public health professionals while implementing the vision set out in the 2013-2016 Surveillance Strategic Plan;

- Modernizing Knowledge Translation by adapting our approach to informing public health decision-making to be more responsive to evolving stakeholder and public needs and maintain leadership in this domain; and,

- Fostering Excellence in Management and Decision-Making by strengthening internal management structures and processes to support investment in people, managing for results optimizing client service within the Branch and continued work on a One-lab concept of operations.

NML Strategic Plan - NML identified five strategic directions in its 2006 strategic planning exercise to guide the laboratory in the fulfilment of its vision as a world-class organization dedicated to the protection of Canadian and global public health:

> ***NML's Team***: "To become the Canadian and international laboratory of choice for research scientists, post-doctorates and graduate students as well as non-scientific employees pursuing a career in public health."
> ***NML's International Presence***: "Strengthen our ties with international partners and our presence in international communities, to foster mutual sharing, support and recognition."
> ***NML's Role in Outbreak Response***: "Improve emergency preparedness and outbreak response capabilities within the laboratory and at the national level."
> ***NML's Contribution to Innovation***: "Continue to develop and transfer knowledge and tools to support the individual and collective efforts of our public health partners in preventing and controlling the spread of infectious disease."
> ***NML's Capacity to deal with Emerging and Rare Diseases***: "Enhance laboratory and field capacity related to the surveillance, identification and characterization of emerging and rare infectious diseases in both human and animal populations."

Federal Laboratory Infrastructure Governance (FLIG) - Science-based departments and agencies rely on federal laboratories to perform activities that may be inter-related in complex and important ways. Inter-departmental FLIG teams are being established to explore the potential for synergies, cost-savings, and overall effectiveness of laboratory operations. NML is participating in a number of areas of review, including contracting practices, library services, network leveraging and co-location agreements.

Framework for Science and Research Excellence - Science and research remain a key Agency priority. Under the auspices of the Office of the Chief Science Officer, the implementation of the new Framework for Science and Research Excellence will further focus on the federal role in public health science and research, clarify leadership responsibilities, and continue to put evidence and science information at the heart of its policies and programs. An Agency priority is to strengthen its accountability and governance structures to better report on, and make more strategic choices about science and research activities. The renewed Office of the Chief Science Officer will take on a more robust role that includes:

- leading the establishment and monitoring of the Agency's science priorities
- supporting innovation, integration and excellence in Agency science
- promoting and aligning Agency science
- nurturing science partnerships
- managing Agency's science support infrastructure

NML will work closely with the Chief Science Officer to help ensure alignment of priorities and resources.

PHAC Report on Plans and Priorities - NML's priorities are also aligned with key responsibilities outlined in PHAC's 2014-15 Report on Plans and Priorities, which are:

- Strengthened public health capacity and science leadership;
- Leadership on health promotion and disease prevention;
- Enhanced public health security; and
- Excellence and innovation in management.

VALUES AND ETHICS

The Values and Ethics Code outlines the values and expected behaviours that guide Agency and NML staff in all activities related to their professional duties. By committing to these values and adhering to the expected behaviours, staff will strengthen the ethical culture of the Agency, contribute to public confidence in the integrity of all public institutions, and contribute to maintaining a healthy and effective work environment. In 2014-15, NML will work with the Manitoba Learning Centre to schedule Values and Ethics workshops in Winnipeg.

CORE VALUES

Respect for Democracy - Public servants at PHAC shall uphold the Canadian parliamentary democracy and its institutions.

Respect for People - Public servants at PHAC shall respect human dignity and the value of every person.

Integrity - Public servants at PHAC shall serve the public interest.

Stewardship - Public servants at PHAC shall use resources responsibly.

Excellence - Public servants at PHAC shall demonstrate professional excellence.

PARTNERS AND STAKEHOLDERS

NML staff partner both directly and indirectly with Agency colleagues and other federal departments and agencies as well as external organizations (e.g., academic institutions, provincial laboratories, regional health authorities, international health organizations) to support the Agency and branch mandates.

NML works closely with the other centres within the branch to provide laboratory-based surveillance and expertise to support surveillance of infectious disease: These Centres include:

- Centre for Communicable Disease and Infection Control (CCDIC)
- Centre for Immunization and Respiratory Infectious Disease (CIRID)
- Centre for Foodborne, Environmental and Zoonotic Infectious Diseases (CFEZID)
- Laboratory of Foodborne Zoonosis (LFZ)

The Canadian Public Health Laboratory Network (CPHLN) is a key partner in providing public health laboratory services within Canada. With secretariat functions funded by NML, CPHLN is comprised of medical or scientific directors from the public health laboratories in each province as well as federal representatives. CPHLN engagement fosters collaboration on public health initiatives and provides a forum for discussion regarding reference service testing, public health

surveillance, and emerging issues while encouraging the sharing of information and best practices.

The relationship between NML and CPHLN is especially critical in preparation and response to an emergency. During the recent H7N9 and MERS novel coronavirus situations, NML and CPHLN worked together to enhance capacity and capability to test for these pathogens.

Through a number of international partnerships including the World Health Organization (WHO), Global Health Security Action Group (GHSAG) and other organizations around the world, NML has established crucial relationships for sharing information and best practices to respond to threats of emerging disease and monitoring the activities of the global community.

It is with such partnerships that NML supports health promotion, prevention and control of infectious diseases, public health research and surveillance activities, and protection of Canadians from the consequences of health emergencies.

NML CORE FUNCTIONS

NML's strategic directions build on the existing foundation of day-to-day reference and surveillance work for established infectious diseases of interest. Disease threats such as hepatitis, nosocomial infections, and sexually-transmitted infections - to name a few - still profoundly affect the health of many Canadians, even though they may not garner the same degree of attention as do the more exotic diseases. Also, as some infectious agents become more rare, local or provincial / territorial laboratories often wind down their testing capability, leaving only NML to fill its role as Canadian laboratories' "diagnostic memory." NML laboratories must remain attentive in managing these threats and dealing with outbreaks of the more common infectious diseases.

Key areas of the core NML functions are:

Reference Services and Diagnostic Activities
Both Canadian and international clients have come to rely on NML for its wide range of reference and diagnostic testing capabilities. Whether providing required expertise or supplementing local capacity, NML performs tens of thousands of tests per year involving a full spectrum of infectious disease pathogens. NML's reference services and diagnostic activities include:

- ✓ providing quality assurance and proficiency testing, including providing reference strains and reagents as well as maintaining supplies of medically-important bacteria and viruses
- ✓ developing and applying new diagnostic methods and technologies within the national surveillance system framework
- ✓ providing highly specialized diagnostic services, including the identification and characterization of emerging and rare infectious diseases
- ✓ performing confirmatory tests which include standard and real-time polymerase chain reaction (PCR) tests
- ✓ disseminating standard processes to provincial / territorial public health laboratories

Surveillance Activities
The Agency participates in more than 50 surveillance systems, the majority of which involve NML. In addition to its domestic activities, NML is associated with numerous international surveillance systems and networks. Overall, NML surveillance activities include:

- ✓ integrating laboratory and epidemiological activities
- ✓ collecting and disseminating data at the event source (whether human, animal, or environmental)
- ✓ supporting joint investigations through inter-jurisdictional collaborative intervention strategies and response actions
- ✓ supporting multi-jurisdictional data sharing and collaboration through the Canadian Network for Public Health Intelligence (CNPHI)

Applied and Discovery Research Activities
NML has also established itself as a world-class research institute wherein research investigates established and emerging infectious diseases, their characteristics, and the means by which they can be transmitted, prevented and treated. NML's applied and discovery research activities include:

- ✓ undertaking collaborative opportunities and exchanging scientific information between NML and external science partners
- ✓ generating science-based evidence to develop public health policies, programs and services
- ✓ providing downstream contributions to risk assessments, preparedness and intervention strategies
- ✓ contributing to the discovery of new therapies and treatments
- ✓ creating new knowledge products via peer-reviewed publications, invention patents, and licensing agreements

Leadership, Training, Network and Capacity Development Between the high calibre of its people, its state-of-the-art facilities and its unique capabilities in national and global infectious disease control, NML shares its expertise and capacity with research scientists, public health and biosafety professionals and students to increase public health capacity and disseminate knowledge, thereby supporting large-scale improvements to the public health system. NML's development and training activities include:

- ✓ demonstrating scientific leadership at national and international levels
- ✓ offering a diverse slate of training courses covering all aspects of the laboratory's operation, including research and diagnostic testing methodologies, workshops for client laboratories, emergency response training, and international bio-containment operations / maintenance workshops
- ✓
- ✓ developing effective networks and relationships with key stakeholders
- ✓ supporting surge capacity through the strategic provision of scientific and technical expertise to deliver an effective public health response.

NML demonstrates its continued leadership in responding to various aspects of infectious disease prevention and control. Its national and international leadership is evident through:

- ✓ providing secretariat support and chairing the Global Health Security Action Group (GHSAG) Laboratory Network
- ✓ promoting and facilitating standardized laboratory procedures, infectious disease surveillance capacity, standardized quality assurance, and adoption of emerging technologies and best practices through the Canadian Public Health Laboratory Network (CPHLN)
- ✓ creating and expanding the secure, web-based Canadian Network for Public Health Intelligence (CNPHI), the Agency's preeminent platform for collecting and

processing data, disseminating strategic intelligence and coordinating response to infectious disease threats
- ✓ hosting the International High Containment Biosafety Workshop, which provides training in critical aspects of bio-containment to biosafety professionals, facility operators and managers from around the world
- ✓ contributing to global laboratory network activities in its role as designated World Health Organization (WHO) regional reference centres, e.g., Mycobacteriology, Measles and Rubella, Enterics and Influenza
- ✓ contributing to the scientific body of knowledge by authoring chapters for standard laboratory texts and helping create international guidelines for entities such as the Clinical and Laboratory Standards Institute
- ✓ supporting NML's Quality Management System, coordinating the ISO (International Organization for Standardization) accreditation / registration, and maintaining the *LabWare-Laboratory Information Management System* (LIMS) Quality Module

Emergency Preparedness and Outbreak Response Activities

Emergency preparedness and outbreak response is the point at which all NML functions intersect. Reference and diagnostic services, surveillance, applied and discovery research, development and training all contribute to NML's role in preparing for, monitoring, identifying and responding to outbreaks of disease as well as other threats involving infectious agents. NML's emergency preparedness and outbreak response activities include:

- ✓ providing Level 4 laboratory capacity to safely and rapidly conduct the initial characterization of unknown pathogens before shifting the work to Level 2 or 3 labs
- ✓ providing first-response laboratory capacity and mobile response field units, including the PHAC/NML lab-truck and lab-trailer, to target acute infectious disease outbreaks as well as bio-terrorism threats or other deliberate acts involving infectious agents
- ✓ mobilizing NML Operations Centre in times of national health emergencies to help manage the crisis

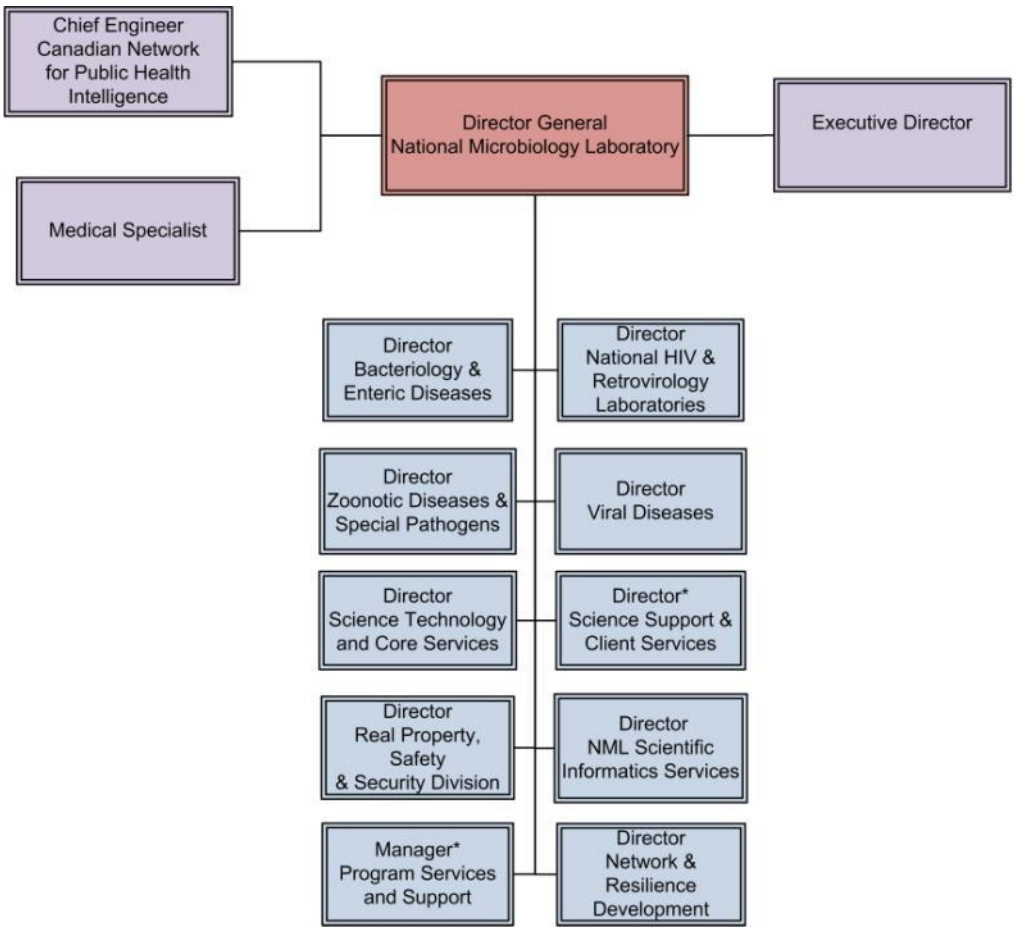
Program Support, Infrastructure Integrity and Management Oversight

In order for NML to excel, staff must be provided with a safe, secure and effective organizational and physical infrastructure. This includes providing:

- ✓ safety and environmental services
- ✓ real property management
- ✓ quality management
- ✓ provision of information technology platforms for scientific support
- ✓ financial management
- ✓ administrative support
- ✓ information management
- ✓ planning and reporting, and
- ✓ procurement.

NML ORGANIZATION

Headed by the Office of the Scientific Director General, NML organization comprises numerous scientific programs and scientific / business support areas. In 2012-13, a number of interim and permanent organizational changes took place as a result of departures of key senior management and inter-agency realignments. This chart reflects the interim organization as it moves through the 2014-15 fiscal year.



Steven Guercio has been appointed Executive Director, overseeing the day-to-day operations of NML.

Florence Lopuck has been appointed Manager, NML Program Services and Support. The following core services will be provided by this section:

- Staffing and salary management support
- Financial planning
- Budgeting and reporting support
- Contracting and procurement of NML and CSSP goods / services
- National / international travel coordination
- Hospitality coordination
- Training / event support
- Reception / mail

In the interim, the position of Manager, Business and Information Management Services will not be backfilled.

On an interim basis, Business Operations has be renamed Science Support and Client Services, with Acting Directors (rotational) Sharla Beddome,Garrett Sorensen and Teresa Fleury leading the following functions:

- Quality Office
- Materiels & Logistics
- Operations Centre
- Laboratory Information Management System (LIMS)

GOVERNANCE

NML Management Council

NML Management Council is the primary senior management forum. Comprised of scientific and business directors and other senior managers, the Council exchanges information and / resolves issues affecting the science programs and overall management of NML. During an Operation Centre activation, NML Management Council also fills the ICS (Incident Command System) role of the Policy Group which helps ensure appropriate human and financial resources are directed to the outbreak response.

Laboratory Executive Committee

The CSCHAH Laboratory Executive Committee is a joint NML/NCFAD committee that addresses and makes decisions on issues that relate significantly to the overall management of the facility, including the use, security, biosafety and management of the physical facility, the common support services and related service levels, and the strategic direction of the Centre's programs and related business plans. The committee is comprised of:

- Scientific Director General, National Microbiology Laboratory
- Executive Director, National Microbiology Laboratory
- Executive Director, National Centres for Animal Diseases
- Director, National Centre for Foreign Animal Disease
- Director, CSCHAH Science Support and Client Services
- Director, CSCHAH Real Property, Safety and Security Division

Institutional Biosafety Committee

The CSCHAH Institutional Biosafety Committee (IBC) acts as an independent review group for biorisk (biosafety and biosecurity) issues within the facility. The IBC has oversight of biorisk issues pertaining to pathogen handling protocols and risk assessments of research projects. It will help ensure protective measures have been addressed thereby minimizing hazards to personnel, the facility and the environment to an acceptable level.

Occupational Safety and Health Committee

NML and NCFAD Occupational Safety and Health co-Committee has a strong presence to address and facilitate resolution of safety and health issues. The Committee also promotes safety awareness and proactively recommends training with respect to health and safety programs and procedures.

Community Liaison Committee

The Community Liaison Committee helps maintain an atmosphere of public trust and confidence between the Centre and the community. It meets regularly to seek out and provide pertinent information to the community to ensure transparency and to foster a greater understanding of the activities of the CSCHAH. The Committee also monitors safety issues for the community and for the staff of CSCHAH. The Committee consists of volunteer members representing a wide range of community groups including community residents, scientists, health care professionals, agricultural professionals, and educators.

Animal Care Committee
The CSCHAH Animal Care Committee (ACC) oversees the care and use of the animals intended for research, testing and teaching at the CSCHAH. The ACC follows the requirements set out by the Canadian Council on Animal Care (CCAC) and the commitment of the CSCHAH to establish high ethical standards for the care and use of animals. The 12-person committee includes representation from management, ACC secretariat, bio-safety experts, veterinary experts, lab program experts and community representatives.

Regional Labour Management Consultation Committee
To foster positive, transparent and consultative communications between management and the bargaining agents, NML management and employees participate in the Regional Labour Management Consultation Committee. Members are expected to consult with one another on issues of mutual interest in order to facilitate informed and effective decision-making that improves outcomes for all employees and enhances the union-management relationship.

Reference Centre Advisory Subcommittee
As part of the Canadian Public Health Laboratory Network (CPHLN), the Reference Centre Advisory Subcommittee (RCA SC) makes recommendations regarding the provision of microbiology reference services in Canada through NML external program reviews. On a triennial basis, all PHAC-funded programs providing reference microbiology programs are required to undergo an external review. The RCA SC coordinates the overall assessment of the annual reports and evaluations. Independent subject matter experts and/or client laboratories are contacted by NML and are requested to complete a standardized evaluation template, assessing the reference service program. The RCA SC synthesizes the key observations and recommendations from the external evaluations and makes consensus recommendations for NML's consideration, which become part of the programs' Annual Report updates thereafter.

PLANNING AND REPORTING OVERVIEW

Planning and reporting activities have become increasingly important components in the operation of the CSCHAH facility, NML science programs, and supporting business groups. These activities:

- serve internal management needs and inform stakeholders
- articulate the operations, activities and programs within the Agency, including business objectives, implementation plans and outcomes
- keep operations on track and respond rapidly to evolving priorities
- provide evidence that NML is effectively meeting its goals, mission and mandate

NML planning and reporting cycle produces two primary outputs which in turn feed into a variety of Agency-level products:

NML Operational Business Plan

This plan annually consolidates and summarizes each area's goals, priorities, activities, measurements, and proposed changes. NML Operational Business Plan:

- provides an overview of over-arching components, incorporates strategic and business components;
- outlines yearly priorities, and integrates the financial and human resources elements; and
- feeds into all NML and Agency planning documents such as the budget process, Agency Operational Plan, Report on Plans and Priorities (RPP), Sustainable Development Strategy, Program Alignment Architecture (PAA), and Performance Management Framework.

NML Annual Reports

NML Annual Reports consolidate and summarize each NML program's activities and results for the preceding fiscal year. NML Annual Reports:

- serve to measure activities against NML Operational Business Plan;
- provide the basis for client and expert peer-review feedback, enabling continual improvement opportunities as part of the ISO-based quality system; and
- feed into NML/PHAC reporting documents such as the Chief Public Health Officer Annual Report, Departmental Performance Report (DPR), Sustainable Development Strategy, Program Alignment Architecture and Management Accountability Framework (MAF).

Other Planning and Reporting

PHAC Agency Operational Plan - Agency Operational Plans (AOP) replaced the Integrated Operational Plans. The AOP will be a series of components that are informed by and built on the guidance provided in Agency plans including the 2014 - 2015 Report on Plans and Priorities, the Corporate Risk Profile (2013), the PHAC Investment Plan, the 2012 - 2016 IDPC Strategic Plan and the findings of recent audits, evaluations and environmental scans. Each Branch's AOP component will focus branch initiatives and the allocation of resources on the achievement of key priorities.

Canadian Pandemic Influenza Plan - The Canadian Public Health Laboratory Network (CPHLN) Secretariat has worked with provincial and federal stakeholders to ensure Annex C of the Canadian Pandemic Influenza Plan for the Health Sector (CPIP) is updated and is currently going through the appropriate approvals.

Emergency Response Plans – As part of the Health Portfolio Joint Emergency Preparedness Committee (JEPC), NML participated in the development of a HP Strategic Emergency Management Plan (SEMP) to help guide the organization during public health emergencies. NML Operations Centre has its own Emergency Response Plan that is aligned with the overarching Health Portfolio ERP. NML also participates in the JEPC Operational Sub-Committee to help ensure lessons learned as part of the After Action Reviews (AARs) are actioned appropriately.

Business Continuity Planning - In 2012-13, the responsibility for NML's Business Continuity Plans (BCP) moved from Corporate Security to NML Operations Centre to better align the work already being conducted on the CSCHAH Building Emergency Response Teams (BERT).

Performance Management Framework (PMF) - The Agency's goal setting, measurement control, evaluation and feedback is undertaken via the Performance Management Framework tool. Currently, NML primarily supports the Agency's Program Activity 1.1.3, "*Public Health Laboratory Systems"*. The expected result of this Program Activity is that public health decisions and interventions by public health officials are supported by research and timely and reliable

reference service testing. To that end, NML uses the following Performance Management Framework (PMF) indicators to help measure performance:

- Percentage of accredited reference service tests performed within the various specified turnaround times
- Number of citations of laboratory research publications in the current year to publications in that year and the preceding two years.

Evaluation of Food-borne Enteric Illness Activities at the Public Health Agency – Issued in March 2012, this report summarizes an evaluation of the prevention, detection and response to food-borne enteric illness activities at the Public Health Agency of Canada. In response to the recommendations, IDPC and Agency partners are seeking to improve an Agency-wide and interdepartmental strategic approach for food-borne enteric illness. Additionally, the Agency will address capacity issues in detecting and responding to food-borne outbreaks and continue to participate in exercises of the Food-borne Illness Outbreak Response Protocol (FIORP) and the Food-borne Illness Emergency Response Plan (FI ERP).

RISK MANAGEMENT OVERVIEW

The Agency has identified its most important corporate risks, risk treatments and related performance indicators as part of the Corporate Risk Profile (CRP 2013-2015).

The CRP contains the five corporate risks are:

- Emerging and Re-Emerging Infectious Respiratory Diseases – Pandemic (including, but not limited to influenza): There is a risk that the Agency will not be able to effectively monitor, detect and coordinate a response to infectious respiratory disease outbreaks, and effective medical countermeasures will not be available, leading to significant morbidity and mortality, adversely affecting the public's trust in the Agency.
- Infectious Disease – Antimicrobial Resistance (AMR): There is a risk that the absence of a comprehensive national action plan may exacerbate the growing impact of antimicrobial resistance on the health and well-being of Canadians, leading to a loss of public confidence in the Agency.
- Food Safety – Emerging and Re-Emerging Food-Borne Diseases : There is a risk that the Agency will not receive all relevant, integrated information to inform early interventions, and, that partners and stakeholders will not be aware of the information generated by the Agency in a timely manner required to prevent illness, resulting in a loss of public confidence in the Agency.
- Infectious Disease – Emerging and Re-Emerging Vector-Borne Zoonotic Infectious Diseases (Lyme disease): There is a risk that the total burden of vector-borne disease will increase without a national approach to monitor and assess these diseases and to enable the implementation of prevention and control measures, adversely affecting the public's trust in the Agency.
- Chronic Disease – Effective Upstream Interventions (to address risk factors and conditions and protective factors): There is a risk that, without adequately refocusing the Agency's activities in science/research, surveillance, policies/programs and partnerships towards the upstream—social determinants, protective factors and risk factors—the Agency's relevance in health promotion and disease prevention within the national public health system will be compromised.

NML has worked as part of the Agency's Risk Management Oversight Committee to develop proposed treatment strategies for each of the identified corporate risks.

With NML itself, a key risk is that NML's science capacity has decreased over time in a number of areas. Key scientists and administrators have left NML in recent years and there is an ongoing risk for not being able to recruit and retain essential personnel. This lack of laboratory depth has left the Agency vulnerable to provide adequate response to outbreaks involving, among others, hemorrhagic illnesses, enteric / foodborne diseases, severe respiratory viruses, multidrug-resistant bacteria, zoonotic diseases, and bioterrorist events, NML has been working with other areas of the Branch to define the longer-term physical requirements required for high-containment research capacity. At the same time, NML is also working with senior management to bolster the near-term scientific capacity within the existing NML programs and facilities.

For day-to-day operational risk, the risk management issues are being effectively dealt with by NML on numerous fronts:

- NML's Quality Office oversees the organizational quality management system. The principles and processes associated with ISO quality standards allow science and support areas to identify key processes, critical control points, accountabilities, and training requirements.
- NML Operations Centre continues to provide training and exercise opportunities for emergency preparedness and response to NML, other Agency stakeholders / responders and external responders. The universal Incident Command Structure (ICS) is used as a basis for event management and positions NML to provide a coordinated response to any local, national or international public health incident or emergency. An NML Operations Centre Director is on call 24/7/365 and is NML emergency contact outside of normal working hours.
- Implementation of the Agency's *Human Pathogens and Toxins Act* (HPTA) will reinforce and establish consistent, safe laboratory practices throughout Canada, helping prevent accidental and intentional releases of these potentially dangerous agents. Implementation will also ensure all federal, provincial, and private laboratories in Canada are adhering to the laboratory biosafety guidelines. NML has begun a number of initiatives that further enhance their biosafety and biosecurity as well as ensure compliance with the HPTA. Activities include:
    - enhancing functionality of the Laboratory Information Management System (LIMS) to include inventories of pathogens and valuable biological materials;
    - bringing research programs into LIMS in addition to diagnostic programs to ensure specimen inventory management;
    - incorporating the new CWA 15793:2011 International Laboratory Biorisk Management Standard into existing quality management systems; and
    - undertaking research and validation testing of new and experimental biosafety equipment, disinfectant techniques, and biosafety methodologies.
- The 24/7 NML Operations Centre Directors participate in the Public Health Daily Intelligence Meetings to discuss key all-hazard public health events/issues. These discussions are used as a mechanism for the Directors General to brief up to the ADM and senior PHAC or Ministerial officials.

These various internal initiatives will help NML to address and effectively manage risks by ensuring consistency in processes, identifying gaps or opportunities to be addressed, training key staff, and aligning and integrating with the risk-based strategies and initiatives within the Agency.

NML LEARNING OVERVIEW

Given the extensive expertise and academic leanings of staff, it is no surprise that NML has developed a strong learning culture over the years. Staff knowledge of a wide variety of infectious disease related topics is frequently shared for the benefit of others in the field. They also recognize the importance of continuous learning for themselves and how they must maintain and advance their own skills and knowledge in order to maximize their potential.

There is considerable ad hoc training, frequently on-the-job, provided to scientists and technicians from laboratories located across Canada and around the world. This often involves extended visits to CSCHAH.

With the PHAC-Health Canada corporate services merger, NML has come to benefit from the local Human Resources-led Learning Centre. This has resulted in increased non-technical training opportunities, frequently on-site, for NML staff.

The formal training programs at NML continue to be further refined and better organized as time goes on, providing the best learning experience in the most efficient manner. Short descriptions of some of the larger training programs follow:

SES University – the Safety and Environmental Services (SES) team has developed a series of courses that are presented on a regular basis for staff; many are mandatory for those working in certain areas of the facility. The annual training curriculum includes the following courses:

- Autoclave Use
- Biosafety Cabinet (BSC) training
- Chemical and Biological Spill Training
- Chemical Storage and Compatibility Training
- Containment Level 3 Refresher
- First Aid/CPR/AED Certification
- Respiratory Training including PAPR (powered air purifying respirator)
- Transportation of Dangerous Goods
- WHMIS (Workplace Hazardous Materials Information System) and General Lab Safety Training
- Ergonomics
- Radiation training
- Occupational Safety and Health training for managers

In 2013-14, SES also provided training to visiting scientists on the X-ray Irradiator.

SES is working with Special Pathogens to develop a CL-4 training program for international collaborators starting June 2014.

A new system, utilizing the laboratory information management system used to tracks samples, is being established to improve the ability to record, track and query training for lab staff for quality management system purposes.

Building Emergency Response Teams (BERT) – An *Incident Response Manual* has been developed for the Canadian Science Centre for Human and Animal Health to guide the actions of responders to internal, building-based incidents. While BERT is a responsibility of the Real Property, Safety and Security Division, the Operations Centre (OC) coordinates the training for

the key internal specialists as the system is modelled after the Incident Command System and the OC team specializes in emergency response. There are now 50 staff members trained to fulfill BERT roles. Exercises have taken place to test the process and ensure a smooth response.

The BERT curriculum includes the following courses:

- ICS 200
- HazMat Awareness
- CERT Spill Control
- Risk Management
- Fire Protection & Emergency Planning

SES continues to work with the OC team to conduct exercises with external responders such as the Fire Commissioner, Police Service and HazMat Teams to ensure readiness.

Plans are in progress to develop a BERT team for the new JC Wilt Infectious Diseases Research Centre.

JC Wilt GLP/Training Lab - The GLP/Training Lab at the JC Wilt Infectious Disease Research Centre began operation in January, 2014. It is a suite of rooms that includes a main general lab area, a tissue culture suite, as well as a suite of rooms for molecular work. The GLP/Training Lab is available to the staff at the NML for training internal and/or external clients or for performing GLP-compliant studies, where a more controlled environment is required.

Emergency Preparedness and Response - NML has now trained more than 425 staff in Level I of the Incident Command System (ICS) and NML Emergency Operations Centre (EOC); more than 185 have gone on to complete Level II, and 95 of those, Level III as well. Many NML employees have also participated in advanced training in Emergency Management Exercise Design. This ongoing training has been key in creating a solid understanding across the organization of NML's unique laboratory role in outbreak response; it prepares staff not only to work in NML Operations Centre (OC) during critical situations but also to understand the functions of the OC to ensure smooth operation and communication between the Operations Centre and lab staff during those periods.

MERT/BADD Training and Preparedness Exercises - NML's Bioforensics Assay Development and Diagnostics (BADD) Section increases Canada's level of preparedness to respond to intentional biological events in Canada and provides on-site detection at high-profile international events through the operation of the Microbiological Emergency Response Team (MERT). They also help to prepare responders across the country for potential biological emergencies.

BADD conducts BioBasics and BioAdvanced courses for first responders and the National CBRNE (chemical, biological, radiological, nuclear and explosive) Response Team on an annual basis. This training ensures appropriate sampling protocols are in place to meet safety, analytical and forensic standards and that processes can withstand legal scrutiny, if required.

MERT participates in national and international training exercises to ensure that PHAC is maintaining an appropriate level of preparedness as the authority on bioterrorism in Canada. This involves deploying a response team capable of in-field diagnostic tests along with a mobile Containment level 3 laboratory. In April 2013, they participated in a quadrilateral exercise with Australia, the U.S. and the U.K. in Virginia Beach, as well as a Canadian field exercise in Suffield, Alberta in October, 2013. MERT is currently contributing to preparations for 2015 CAPEX to be hosted by Canada within Ontario.

Plans are being made to add another provincial laboratory partner to the Canadian Laboratory Response Network (CLRN) which will require BADD to provide training, test their analytical competency and deploy appropriate testing to their site.

Emergency Response Assistance Plan - NML assumed management responsibility for the Emergency Response Assistance Plan (ERAP) program in 2010. Transport Canada requires that an ERAP be in place to deal with national transportation emergencies involving the shipment of Risk Group 4 (RG4) pathogens. Emergency response teams, trained in specialized equipment and decontamination procedures, are activated whenever a RG4 specimen is shipped and remain active until the shipment has safely reached its destination. Safety and Environmental Services hosted their first national Emergency Response Assistance Plan (ERAP) training in 2011-12 and 2013-14 for provincial and territorial emergency response teams and will continue providing the training bi-annually.

Microbial Informatics Workshops – NML's Bioinformatics and Genomics Core hosted a two week-long workshop on microbial informatics in 2013-14 (February 4-15). Participants were from CFIA, Agriculture Canada, Health Canada, PHAC, Public Health Ontario, BC Centre for Disease Control, University of Alberta, and University of Manitoba. Course participants gained knowledge and experience working with advanced computing infrastructures and bioinformatics technologies to analyze microbial whole genome sequence data from raw sequence reads to data analysis within a biologically meaningful context. Another session is being planned for May 2015.

Residency Programs - Under the supervision of NML scientists, approximately 25 post-doctoral fellows, post-graduate medical fellows and graduate students (in collaboration with the University of Manitoba) are offered residency placements annually. The program also helps to develop undergraduate students from across Canada through the Federal Student Work Experience Program and Cooperative Education Programs.

Scientific Seminar Series - NML offers a scientific seminar series to provide educational opportunities for staff as well as to promote the awareness and understanding of the scientific activities taking place at the Canadian Science Centre for Human and Animal Health. Along with the NML series, staff at the lab have spearheaded the formation of an Agency-wide weekly seminar series called PHACtually Speaking. This series is intended to bridge the gap between science and policy by including presentations on both.

International High Containment Workshops – Over the years, hundreds of biosafety and operations professionals have been training to run safe high containment facilities through courses at CSCHAH. Following a brief hiatus and reassessment, the workshops are tentatively being planned to resume in 2014-15. The International High Containment Operations and Maintenance Workshop will likely run in the fall of 2014 while the International High Containment Biosafety Workshop is being considered for 2015.

Global Health Security Action Group Laboratory Network (GHSAG-LN) - In its capacity as the Laboratory Network Secretariat, NML help plan and coordinate all of the network's activities. These activities include meetings of the laboratory representatives from the G7 countries plus Mexico, The European Commission, and the WHO. The secretariat supports the coordination of workshops that often include participants from other countries such as those from the Emerging Dangerous Pathogens Laboratory Network (EDPLN). The workshops train laboratory staff and enable laboratories to play their role in protecting the health and safety of their populations as well as strengthening global public health security and meeting IHR requirements. In 2014-15 workshops will include:

- Orthopoxvirus Detection Workshop (Robert Koch Institute, Germany)
- BSL4 Training Workshop (National Microbiology Laboratory, Canada)

- Basic Laboratory Course on Electron Microscopy of Infectious Diseases (Robert Koch Institute, Germany)
- Third Unknown Pathogens Exercise (TBA)

The Lab Network secretariat has been working closely with the Risk Management and Communication Working Group to support the development of a sample sharing agreement for non-influenza agents of high pathogenicity during public health emergencies. It is also engaged in the assessment of GHSAG core capacity and priority setting work.

As can be seen by how extensive and well-organized these offerings are, NML's training systems and processes have been refined over the years. The various curricula are well-thought through and provide essential training required either internally or for our many partners and stakeholders.

Along with that outlined above, NML also provides some public course offerings. Many of the scientists are cross-appointed to the University of Manitoba and provide lectures in courses such as Microbial Pathogenesis. Also, during the fall term of 2013, 12 NML experts provided seminars on a wide-variety of topics for a University of Winnipeg 55 Plus course that were extremely well received.

HUMAN RESOURCES OVERVIEW

The government-wide Deficit Reduction Action Plan (DRAP) process allowed the Agency to identify areas where it can better focus the federal role in public health and maximize efficiencies. The DRAP process established a new, long-term FTE baseline for NML which will help foster more strategic and predictable approach to future staffing.

NML worked closely with Branch management to consider affected /surplussed staff for positions through the Agency's Workforce Management Committee. As a result, a blueprint for staffing vacant positions was developed and will continue to be implemented throughout 2014-15.

Despite the current level of uncertainty in public sector staffing, NML remains committed to its strategic vision to be the Canadian and international laboratory of choice for scientific and non-scientific staff - to ensure employees have the right skills and knowledge, are aligned in effective organizational structures, and are engaged in productive work environments to achieve expected results. Each day, NML relies on its staff to provide their ingenuity, expertise and skill in contributing toward PHAC's objectives.

In response to the 2011 Public Service Employee Survey (PSES), the Agency initiated a Tiger Team to capture the ideas and opinions on how to improve the workplace. The Agency's PSES Action Plan will continue to be implemented in 2014-15 and will focus on four priority areas that employees have identified as important:

- Governance – employees value timely, efficient and collaborative decision making, and efficiency in governance processes
- Leadership – employees look to senior management for leadership, and want to work in a transparent environment that rewards and promotes excellence
- Employee engagement – employees want to feel connected to what is happening across the Agency
- Workplace wellness – employees want an organization that supports a welcoming, inclusive and healthy work environments.

As with the Agency, NML intends to use the survey information to develop an action plan to address areas for improvement. The PSES results support the workplace assessment NML conducted in August 2010 and the areas that NML is already taking steps to address.

Beyond the Agency's PSES Action Plan, NML remains committed to advancing effective staffing processes. Examples include:

- participating in the Agency's career progression process for research scientists that will bring together the federal research directions and the results-based accountability management, as well as addressing the new human resources management legislative and policy requirements;
- encouraging and facilitating succession planning and drawing talented younger people into the organization;
- continuing to attract and develop highly-skilled graduate students and post-doctoral fellows through available mechanisms, such as the Natural Sciences and Engineering Research Council of Canada (NSERC);
- engaging in various outreach activities involving high schools, universities and organizations such as the Inner City Science Centre;
- ensuring qualified candidates have equal opportunities for employment and that persons best-qualified for employment are drawn from pools reflecting the diversity of Canadian society; and
- identifying positions requiring services in both official languages and staffing accordingly.

NML will also work to implement the new Treasury Board Secretariat Directive on Performance Management that came into effect on April 1, 2014.

ORGANIZATIONAL QUALITY OVERVIEW

NML Laboratory Quality Office provides support and advice related to Quality Management System requirements for all groups within the organization. NML's comprehensive quality system provides confidence to its clients and stakeholders, safe and consistent procedures for staff, and an internationally-recognized standard for conducting business.

NML is pursuing ISO accreditation for its laboratory and business functions. For the laboratories, the NMLwill have achieved ISO 17025 accreditation for 60 widely-performed tests, with 11 laboratory sections accredited or assessed for accreditation by the Standards Council of Canada (SCC). Work continues to expand the scope of accreditation. Additionally, the National HIV & Retrovirology Laboratory is accredited to ISO 15189.

For the business and facility areas, Real Property, Safety and Security Division's Rendering and Bio-waste System has been registered to the ISO 9001 standard since 2001. The addition of RPSSD's Facilities Quality Systems Manager will allow the division to standardize and capture their project forecasting through risk prioritization, their investment decision process, and their project contingency management and risk mitigation.

In August, 2012, ISO 9001 registration was granted for several business support processes including the Operations Centre, Information Management, Finance, Human Resources, Procurement, Material Management and Software Development & Support.

Plans for fiscal year 2014-2015 include expanding ISO 9001 registration to include the Genomics section as well as continuing work to expand ISO 17025 laboratory accreditation.

INNOVATIVE TECHNOLOGY OVERVIEW

The National Microbiology Laboratory is a trailblazer in technological advancements related to infectious disease prevention and control. The need for public health security has never been clearer. New microbes are emerging and spreading, drug resistance is rising, and bioterrorism, the deliberate release of dangerous biological agents, remains a modern day reality. Globalization of travel and trade also increases the chance and speed of these risks spreading. NML's role in public health security / biosecurity is rooted in science and based on the concepts of early prevention, detection and response. Operationally, these concepts are empowered by technology. We live in an age in which innovation and advancement of knowledge is enabled by technology. Like so many fields, public health microbiology has experienced exponential growth in increasingly sophisticated laboratory and analytical tools. These fields rapidly evolve and are increasingly technical. Just as business operations must adapt technological advancements to remain relevant (e.g., telecommunications evolved away from fax), adoption and adaptation of technology is similarly crucial to public health. These advancements enable us to prevent, detect and respond to the ever increasing challenges posed by microbial pathogens in the most rapid and cost effective manner.

Advanced technology approaches (such as electron microscopy, genomics, proteomics, bioinformatics, and molecular pathobiology), along with traditional methods, are used at the NML for priority public health activities. Most of these advanced technologies are centralized within the NML's *Science Technology Cores and Services (STCS) Division* for efficient and cost-effective shared services, and for enabling multi-disciplinary approaches to achieve timely and thorough understanding of pathogens from many different lines of evidence.

- ✓ NML efficiently manages its technology via sharing and centralization using a core facility (shared service) model
- ✓ Its core technology is cutting-edge and rapidly changing, and puts NML in a leadership role for the nation
- ✓ Its core technology does double-duty in many cases, supporting the NML in surveillance, reference/diagnostic services, but also supporting the NML in innovation and development of better public health methods
- ✓ Such core technology gives the NML unique capacity to respond to public health issues or events in a way that is unachievable by any other lab in Canada

One of the NML's key technologies is *Genomics,* which plays an increasingly important role in detecting and understanding pathogens. Modern genomics technologies allow scientists to observe the entire genome (all DNA, the "blueprint") of a pathogen quickly and at a relatively low cost. Genomics, together with data analysis, allow scientists to:

- Design new detection assays for field settings
- Assist in outbreak investigations by pinpointing related infections (example: for contamination traceback as was needed for the 2008 nationwide Listeriosis outbreak)
- Rapidly identify and characterize emerging, re-emerging and novel pathogens (example: H9N7 influenza and MERS coronarivus)

NML, in collaboration with partner labs, is leading the way to apply genomics technology to near-real-time response during outbreak events—enabling faster detection of source(s) of outbreaks and faster understanding of virulent microbes. NML is leading the charge by sequencing and depositing thousands of bacterial genomes to a national pathogen genomes database that NML is developing, representing an outstanding, comprehensive resource that will hugely benefit international infectious disease surveillance and outbreak management efforts.

Proteomics and mass spectrometry is another key technology at the NML, which complements the genomics technologies. It focuses on protein (i.e., gene products) expression and addressing the question, *how does the pathogen function*? For example, why are some pathogens more harmful than others or resistant to antibiotics? Proteomics also is used for rapid, molecular-level diagnostics, for example, identifying unknown proteins (e.g., toxins) or pathogens (e.g., bacterial species); or to identify future options for front-line disease treatments.

Genomics and proteomics are just two examples of the NML's modern technologies that generate very large data sets (sometimes called 'big data'). A major challenge is how to rapidly interpret meaningful information. Powerful computational tools and a scientific computing environment are essential to convert such complex data into results for public health. Fortunately, the NML's Bioinformatics group has elite capacity in this regard, and these have contributed to NML's placement at the global forefront of "microbial detective" work. This STCS group applies state of the art data processing strategies (computing algorithms) to enhance data interpretation capacity and turnaround to benefit NML and its stakeholders. For example, Bioinformatics is developing user-friendly analytical tools supporting public health to enhance the sensitivity, specificity and turnaround time of pathogen typing and detection; and is also contributing to global efforts for a real-time outbreak analysis system based on pathogen genome data, also called enhanced 'genomic surveillance'.

Recognizing that the NML operations requires very unique analytical capacity and informatics services compared to standard office requirements, the Branch also maintains a Scientific Informatics Services division reporting directly to laboratory management. With its distinct scientific mandate and specialized technologies, the NML relies on these IT specialists and their unique expertise for support in maintaining required infrastructure including equipment procurement, power and cooling requirements, and data back-up. Beyond this, the IT group also supports other mandate-responsive initiatives such as a science computing enterprise network, CANARIE, Bioinformatics, PulseNet and Labware-LIMS.

The Bioforensics Assay Development and Diagnostics unit leverages technologies to develop novel reagents, monoclonal antibodies and diagnostic assays for Branch stakeholders. The work of this section provides a stable, Canadian-based supply of needed diagnostic and detection antibody reagents to emerging and high-threat pathogens, providing a centre of excellence for novel reagent development and a reduction in the reliance on foreign suppliers.

The Molecular Pathobiology group employs an array of technologies (optical and CT imaging and confocal laser microscopes) to perform non-invasive monitoring of cell trafficking and gene expression patterns to better understand infectious disease progression in animal models. Importantly, these state-of-the-art technologies also can be harnessed in tissues and isolated cell studies, assisting the Branch in translating lab data to prevention, diagnosis and treatment.

A unique Applied Biosafety group has been developed within the NML to focus on laboratory containment and decontamination products and methodologies. The knowledge generated is essential in situations such as the 2008 Listeriosis outbreak, when facility disinfectants were found ineffective under the cold conditions of a meat processing plant. This highly specialized section is uniquely outfitted with gaseous room decontamination capability and related technologies. Laboratory and industry standardized testing methodologies are employed to achieve highly reproducible and valid results. These are used to test for pathogen removal efficiency (decontamination validation) and training programs on behalf of industry and public health stakeholders. In addition to publications in peer reviewed scientific journals, research outputs include reports which are sent to the Bureau of Gastroenterology, Infection, and Viral Diseases Therapeutic Products Directorate for consideration as policy guidance.

A fairly recent addition to the technological capacity at the NML is the CompacT, an automated robotics cell culture system. The platform is capable of maintaining up to 35 unique cultured cell lines at one time with guaranteed quality assurance and uniformity, and performing automated

(culturing) expansion and harvest for use in scientific experiments. The unit is also capable of operating overnight and weekends without human interaction and operates as a core cell supply facility to various groups within the NML. This capacity enables us to be at the forefront in identifying novel pathogens (such as H7N9 influenza and MERS coronavirus).

The above technologies are highly advanced, specialized and rapidly evolving. By keeping pace with technological advancements in these areas, the NML is ensuring public health security for all Canadians.

FINANCIAL OVERVIEW

Two funds centres exist under the authority of NML Scientific Director-General:

- the National Microbiology Laboratory Funds Centre is funded wholly by PHAC and encompasses NML science programs and directly related support; and
- the Winnipeg Common Services Centre (WCSC) Funds Centre is funded by PHAC and CFIA on a 65/35 cost-sharing basis, with the Real Property Safety and Security Division and the Business Operations Division providing facility and business services to both NML and NCFAD.

National Microbiology Laboratory Funds Centre

The National Microbiology Laboratory's sources of funding include A-Base allocations, Canadian Safety and Security Program ("CSSP" previously CRTI) funding, and other collaborative funding vehicles.

Permanent Branch Reduction Exercise– As part of the Permanent Branch Reduction Exercise, NML along with IDPC Branch counterparts will be applying a reduction to their O&M budgets. The reduction is not centre/labs specific but a Branch cut. The permanent 5% reduction will be in effect for IDPC centres/labs until work plans are fully developed and centres/labs demonstrate requirement for funding. The intent being to allow for potential reallocation based on arising Branch/Agency priorities.

	Salaries	O&M	Salaries +/- from 2013-14	O&M +/- from 2013-14
Initial 2014-15 Notional Budget (100%)	$23.383M	$11.184M		$(.635M)
Add/Science IT Permanent transfer to NML	$2.415M	$0.878M		
Adjusted 2014-15 Notional Budget	$25.798M	$12.062M		$(.635M)

B-Base Funding Summary	O&M
CSSP	$0.270M
Genomics Research & Development Round 6 projects	$1.025M
Genomics Research & Development – Food and Water Safety Pilot	$0.481M
BSE – MC Approved, Ongoing Treasury Board submission funding to be confirmed through Supplementary Estimates	$0.520M
B-Base Total	$2.296M

Winnipeg Common Services Centre

The Winnipeg Common Services Centre (WCSC) sources of funding include A-Base allocations from PHAC and CFIA. The cost-sharing arrangement with CFIA/NCFAD allows PHAC/NML to recover the equivalent of 35% of the overall building services, physical security and common support activities used to support NCFAD.

With the JC Wilt Facility operational in 2014/15, the full of the associated ongoing Treasury Board funding was permanently transferred from the Corporate Project Management Office to Winnipeg Common Services. This budget will support ongoing operation of the facility, and will be reallocated between the two NML Centre programs accordingly as in-year transfers.

The 2014-15 WCSC Notional A-Base Budget, was as follows:

	Salaries	O&M / LTCP	Salaries +/- from 2013-14	O&M/LTCP +/- from 2013-14
Initial PHAC 2014-15 Notional Budget (100%)	$3.4M	$8.183M		$(0.486M)
Add: JC Wilt Treasury Board Submission	$1.04M	$5.548M		
Add: CFIA Recovery	$1.935M	$2.912M		-
Total:WCSC Notional Budget (PHAC/CFIA)	$6.38M	$16.643M		$(0.486M)

Treasury Board Submissions

NML also receives funding from several targeted Treasury Board Submissions. These include:

- **Avian Influenza / Pandemic Treasury Board Submission** - Some of the funding from the Treasury Board Submission, *"Preparedness for Avian and Pandemic Influenza"* has now been rolled into NML's A-Base funding, namely for CNPHI and the Laboratory Liaison Technical Officers in P/T labs. The funding for Winnipeg Lab and Space Optimization components, namely the leasing and operation of an offsite commercial warehouse facility and the purchase, refit and operation of the J.C. Wilt Infectious Diseases Research Centre resides with the Strategic Policy and International Affairs Directorate. The funding for the warehouse is now being transferred to Winnipeg Common Services Centre (WCSC) via a Letter of Understanding. It is expected that once the J.C. Wilt laboratory construction project is complete in 2013 and the facility becomes operational, the entire annual ongoing resources totalling $7.24M, including 17 FTEs will be permanently transferred to WCSC.
- **Listeriosis Treasury Board Submission** - Following the 2008 nationwide listeriosis outbreak, the Agency contributed to a Memorandum to Cabinet and Treasury Board Submission to address the areas for improvement noted in the *"Beyond the Listeriosis Crisis: Strengthening the Food Safety System"* report tabled by the Canadian Parliament's Food Safety Committee and also in the Report of the Independent Investigator into the 2008 Listeriosis Outbreak (the Weatherill Report). As part of this Treasury Board Submission, NML is focussing on:

- Developing and implementing a multi-media training module for *PulseNet Canada* outbreak detection and response activities, including laboratory tests, computer-based analyses, and data sharing. Training on the *PulseNet* DNA fingerprinting technique as well as how to analyze and interpret the fingerprints will increase the number of labs and personnel across Canada who can complete this test. This improved capability will in turn further reduce the time it takes to detect a potential outbreak and to link an outbreak to a source. Applying genome sequencing technology as a modern laboratory tool to investigate foodborne diseases, including an innovative lab approach to provide evidence for outbreak detection, tracking to contaminated sources, and identifying potential intervention points.

- **Food Safety Funding Treasury Board Submission -** Under this proposed submission that follows the short-term listeriosis TB submission, the Agency is now requesting $6.6M annually on an ongoing basis to maintain and enhance human illness outbreak detection and response capacity; continue implementation of whole genome sequencing; continue expansion of *PulseNet Canada*; enhance C-EnterNet through expansion to at least three sentinel sites; and establish national epidemiological surge public health outbreak capacity.
- **Genomics Research & Development Initiative (GRDI)** - GRDI forms an integral component of the genomics research program of federal laboratories. This Treasury Board Submission, led by the National Research Council, is currently under in its fifth round of funding applications. The intent of GRDI is to address and renew the ongoing need of federal science-based departments and agencies, including PHAC, to implement rapid developments and innovations in the biological sciences and related large-scale technologies. The funding will be directed toward meeting strategic requirements through research and development projects, and applications will focus on infectious disease, chronic disease, and relevant areas of public health policy. These short-term funds currently support NML projects such as those related to whole-genome sequencing and pathogen characterization. Also included in this current Treasury Board submission was an inaugural, interdepartmental GRDI Pilot project focussing on food and water safety, entitled *"Strengthening Food and Water Safety in Canada through an Integrated Federal Genomics Initiative,"* with over 52 collaborating scientists from six federal departments - representing the largest collaborative research project yet undertaken by the Government of Canada. Key NML outputs will be the bioinformatics platform and pathogen genomics data sets encompassed within a new National Genomics Database (NGsD) to store and search pathogen data and associated metadata for enhanced traceback analysis during public health events. Another key NML output will be bioinformatics training workshops for the pilot project's participating departments and agencies. Lastly, NML will contribute to the development of portable and customizable technologies for rapid, field-deployable detection and molecular characterization of two high priority food and waterborne pathogens.
- **Bovine Spongiform Encephalopathy (BSE) Treasury Board Submission** - As part of the federal government's interdepartmental response to the discovery in Canada of Bovine Spongiform Encephalopathy (BSE) in 2003, the Public Health Agency of Canada's Prion Diseases Program at NML has carried out enhanced surveillance and targeted research for human prion diseases since 2004. This work has been supported by three Treasury Board Submissions in 2004, 2006 and 2009. NML's Prion Diseases Program currently receives approximately $800K annually in operating funding from the 2009 Treasury Board Submission, sunsetting in 2014. This funding is used for:
  - ongoing comprehensive surveillance of human prion diseases;
  - improvements to existing human prion disease diagnostics; and
  - targeted research to discover, validate and apply new diagnostic markers for both human and animal prion diseases.

In addition, NML is investigating novel protein-based diagnostic markers that could provide faster, more definitive diagnoses on living patients. Human prion disease surveillance will need to continue beyond the current submission's 2014 sunsetting date, as cases of variant Creutzfeldt-Jakob disease, the human form of BSE, continue to occur worldwide, and because human disease potentially resulting from BSE exposure in Canada could take decades to develop. Non-zoonotic human prion diseases (which are all potentially associated with public health risks) continue to be confirmed in Canada at the rate of 3-4 cases per month, and the potential zoonotic transmission risks posed to human health by exposure to another animal prion disease (e.g., CWD) remain unknown.

CO-LOCATION OVERVIEW

Along with the inherent cost-savings, the co-location of the Agency's NML and CFIA's National Centre for Foreign Animal Disease (NCFAD) within the Canadian Science Centre for Human and Animal Health (CSCHAH) provides unique and unprecedented opportunities for scientific collaboration in areas where human and animal health intersect. This is illustrated by continued collaborations between NML and NCFAD on various projects including the current Canadian Safety and Security Program funded "science and technology solutions to mitigate vulnerabilities in Canada's food supply". Recently published collaborative studies include Middle East Respiratory Syndrome Coronavirus Antibody Reactors among Camels in Dubai, United Arab Emirates, in 2005; Review of Ebola virus infections in domestic animals; and Immunopathogenesis of Severe Acute Respiratory Disease in Zaire Ebolavirus-Infected Pigs.

The space occupied in the facility is approximately 70% NML and 30% NCFAD. It has been estimated that if PHAC were to solely operate a facility 70% of the size of the CSCHAH, it would still incur approximately 85% of the current total costs. Similarly, if CFIA were to solely operate a facility 30% of the size of the CSCHAH, it would still incur approximately 50% of the current total costs. The combined cost-savings reaped through the co-location can be estimated at approximately $5.0M annually.

Previously jointly owned, in 2012-13, PHAC assumed full ownership of the property in keeping with government preference and the Real Property and Immovables Act. This is the only real property owned by the Agency. Experts in the operation and maintenance of high-containment laboratories manage the building.

A Memorandum of Understanding (MOU) governs the administration of the CSCHAH. As the lead agency, PHAC manages all building services, biosafety, and common support services activities. The MOU outlines a cost-sharing arrangement wherein the equivalent of 35% of overall facility and common support services costs are recovered for support to NCFAD. Common issues are dealt with through regular Laboratory Executive Committee meetings. The co-location of NML and NCFAD and the governing Memorandum of Understanding are being held up as best practices as part of the government's Federal Laboratory Infrastructure Governance (FLIG) initiative.

The overall benefit of increased scientific collaboration between human and animal health programs, along with the cost-efficiencies to the Canadian public, make the CSCHAH a unique operating model for laboratories around the world.

ACCOMMODATIONS OVERVIEW

The CSCHAH is a 29,000 square metre building built on a 15-acre site, with construction finishing in 1998. At this time, the CSCHAH houses over 440 NML staff and approximately 65 NCFAD staff, including students and visiting scientists.

The recently-completed “R-Block” expansion renovated 1,100 square metres and added another 1,400 square metres of space to the facility. The expansion has increased NML and NCFAD specimen receiving capacity and allowed numerous labs to refit their areas to improve their workspace utilization.

Renovations at the J.C. Wilt Infectious Diseases Research Centre, a former provincially-owned laboratory, are nearing completion, with commissioning now being completed and occupancy expected in fall 2013. The National HIV and Retrovirology Laboratory will be relocated from Ottawa to Winnipeg and the facility will also accommodate a centre to promote Good Lab Practices.

NML also operates a 3,000 sq. metre offsite shipping / receiving, warehouse, stores, mail processing and central records operations in a nearby off-site commercial warehouse facility. Approximately 20 personnel are employed at the facility. A storage space adjacent to the existing NML warehouse facility houses NML’s mobile lab-truck, mobile lab-trailer and related supplies.

STRATEGIC INVESTMENT PLANNING (LONG-TERM CAPITAL PLAN)

NML's Real Property, Safety and Security Division (RPSSD) is responsible to deliver Strategic Investment Plan projects within CSCHAH. Sustained and predictable funding will become even more critical for custodial facilities such as the CSCHAH with the transition to the Treasury Board policies on Investment Planning and Management of Real Property. The new policies emphasize the accountability of Deputy Ministers with respect to the management of real property and require departments to measure and document performance.

The CSCHAH Investment Plan is a dynamic document with priorities and requirements changing to align with emerging operational needs, improved technologies and investigational findings. The delivery and management of the Investment Plan falls under the responsibility of RPSSD; however, Public Works and Government Services Canada (PWGSC) resources and timetables have a profound impact on project schedules and expenditures. Notable projects in the 2013-14 fiscal year include:

> **Energy Management Controls System (EMCS)** -The building’s energy management controls system (EMCS) forms the backbone of the laboratory containment system and is an integral component in maintaining the building’s containment integrity. This system controls directional airflow in the labs, without which the CSCHAH would be unable to maintain laboratory containment. However, it has become obsolete, with mainstream controls manufacturers and software controls developers no longer providing new parts or support. The contract has been put in place and parts must be ordered by 2014 per contract provisions. Purchasing of components and installation will continue in 2013-14. Value: Total Budget $5.3M Past Yrs. $4.65M 2014-15 Min. $275K **High Priority**

Additional Chiller Package - A third chiller unit is planned to provide expanded capacity for building-wide cooling requirements. Particularly with the addition of the R-Block expansion, the current two-chiller system no longer provides full redundancy for the building. Failure to address this issue could result in unscheduled air conditioning shutdowns, particularly during heavy load periods. The smaller third chiller will supplement cooling during periods of high load and it will act as the lead during periods of lower demand, reducing energy consumption and thereby reducing our environmental footprint. In 2014-15, RPSSD will continue with an engineering and design study, develop specifications and prepare a construction contract for tender. Infrastructure will be prepared for the acceptance of the new equipment.
Value: Total Budget $1.05M 2014-15 **Medium Priority**

Renderer Replacement - The renderer processes and sterilizes solid waste material removed from PHAC and CFIA's Containment Level 4 and Containment Level 3Ag high containment laboratory facilities. As the equipment nears its end of life an evaluation of potential technologies has begun. The purchasing process will follow this evaluation, with a desired delivery date of late 2014-15 or early 2015-16. Installation will be completed by RPSSD, supplemented by contractors, in 2014-15. The project delivery will be complicated with the scheduling around scientific activities.
Value: Total Budget $575K(est) 2013-14 $0 to 375K **High Priority**

Several other projects have been proposed to begin in the fiscal year 2014-15 and are at various stages of development. The projects slated to begin in 2014-15 include:

- Boiler Burner Replacement, 3 year project ($600K)
- Autoclave Replacement, 3 year project ($600K)
- Proposed Containment Level 2 Ventilation Heat Recovery Loop ($750K)
- Upgrade of Containment Level 3 Effluent Piping to allow for the use of Non-Indigenous Zoonotics (Cost TBC)
- Additional Containment Level 2 Animal Holding (Cost TBC)
- Additional Containment Level 3 Animal Holding (Cost TBD)

SUSTAINABLE DEVELOPMENT OVERVIEW

The CSCHAH contributes to the Agency's Sustainable Development (SD) Strategy which supports the federal government's plans and priorities to meet Canadians' concerns for economic, social and environmental well-being.

The SES unit within the Real Property, Safety and Security Division (RPSSD) is the SD Lead and acts as the regional representative on the Sustainable Development Working Group to contribute and gain feedback on PHAC's Sustainable Development Strategies. SES also organizes the facility's staff involvement in SD events and initiatives such as Environment Week, Commuter Challenge, and Carpool.ca.

NML's sustainable development efforts have been guided through a philosophy of continual improvement. A number of initiatives have been undertaken by the following groups to encourage operational cost savings and support environmental well-being.

Real Property Safety and Security Division - RPSSD strives to optimize efficiencies within the scope of facility management for this laboratory, including heating and cooling systems, waste

disposal, as well as project management (construction/demolition recycling/reusing) practices. Sustainable Development strategies encompass numerous areas of expertise within RPSSD and initiatives include:

- leading a Facilities Management SD Initiative working group to facilitate improvements using in-house expertise or external consultants
- seeking Level 1 certification under BOMA's BESt Building Program.
- investigating and incorporating waste heat recovery / reuse in project design and equipment installation
- directing humidification based on targeted needs rather than a generalized approach
- considering operational costs and environmental impact when purchasing equipment and building materials
- minimizing construction waste or diverting construction waste to alternative waste streams

Safety and Environmental Services - As part of RPSSD, SES works on the SD initiatives from a laboratory safety standpoint. Some of the greening practices undertaken include:

- improving hazardous waste packaging and disposal practices
- introducing a building wide chemical inventory management tool
- identifying and testing safer chemical alternatives
- undertaking experiments to validate greener gaseous decontamination products and methods for both area and biosafety cabinet decontamination

Information Technology - The Winnipeg-based Scientific Informatics Services group is involved in a number of initiatives to reduce energy consumption, such as:

- purchasing energy star equipment where possible
- automating nightly power down of PC's
- configuring printers to go into "sleep" mode
- offering the Web Office service to facilitate tele-work arrangements
- beginning a printer consolidation strategy also intended to reduce the total cost of ownership and IT support overhead
- migrating physical servers to virtual servers thus reducing power and cooling costs

Science Support and Client Services - The Materiel Management section is involved in a number of initiatives to reduce energy consumption, such as:

- having all CFC's removed from equipment prior disposal
- utilizing the Manitoba E-Waste program when it comes on-line
- utilizing the Computer for Schools program for computers and electronic equipment
- purchasing environmentally-friendly consumable products (e.g., recycled paper) wherever possible
- identifying vendors that adhere to sustainable development policies

OCCUPATIONAL SAFETY AND HEALTH OVERVIEW

In its unique capacity to accommodate the study of infectious diseases in both humans and animals at the highest level of bio-containment, the CSCHAH places a high priority on ensuring appropriate safety and security measures are in place to protect its employees - and the surrounding community. Through the vigorous application of health and safety measures, the Centre continues to maintain its reputation as a world-class, state-of-the-art facility.

Real Property, Safety and Security Division - provides comprehensive, in-house expertise to manage and operate the building access controls, air-handling systems and effluent treatment

systems as well as supporting the development and delivery of the CSCHAH environment, health and safety programs. In addition to certification of all containment laboratories, the Safety and Environmental Services group coordinates or delivers most of the safety programs within the facility. This includes the "SES University" program which includes more than 20 courses, "hands-on" demonstrations and presentations on biosafety and occupational health and safety.

CSCHAH Occupational Health Nurse - provides various services to strengthen the Centre's Workplace Health and Safety Program, which includes:

- managing the medical surveillance program and conducting risk assessments
- liaising with on-call infectious disease specialists to review potential lab exposures and administering drugs from the CSCHAH stockpile when required
- managing and coordinating the delivery of the Workplace Health and Safety Program, e.g., immunizations, ergonomic assessments, etc.
- providing in-house consultation for a variety of occupational or non-occupational medical issues to individual employees and CSCHAH committees
- providing phlebotomy (i.e., taking blood) services for work-related requirements
- participating in the development of policies and procedures related to occupational health issues
- serving as a member of the EOC team during activation by acting as Personnel Support Unit Coordinator and providing support for deployed staff and their families as well as for EOC and lab staff

Occupational Safety and Health Committee - has a strong presence to address and facilitate resolution of safety and health issues. The Committee also promotes safety awareness and proactively recommends training with respect to health and safety programs / procedures.

NML PROGRAMS

Bacteriology and Enteric Diseases

The Bacteriology and Enteric Diseases Division, currently led on an acting rotational basis by Michael Mulvey, Celine Nadon, Joyce Wolfe and Raymond Tsang, focuses on bacterial diseases that are acquired in the community, in hospitals, or through contaminated food or water. The focus of all laboratory programs in the Division is to lead the national monitoring of bacterial diseases with local, provincial and federal partners across Canada, and to contribute to the public health responses in relation to antibiotic therapy, vaccination, outbreak detection and investigation of the sources of disease.

Monitoring programs are led through the provision of national reference laboratory testing services, and, as a central depository of national laboratory surveillance data, the Division's programs contribute to the coordinated assessment of these disease data. With NML's public health partners, these efforts then lead to response, prevention and control activities. All areas of the Division also conduct research to provide innovative approaches for the improved detection, identification and scientific understanding of both established and newly emerging pathogens.

The Bacteriology and Enterics Division comprises five areas:

- ✓ Enteric Diseases
- ✓ Antimicrobial Resistance and Nosocomial Infections
- ✓ Streptococcus and Sexually Transmitted Infections
- ✓ Syphilis Diagnostics and Vaccine Preventable Bacterial Diseases
- ✓ Mycobacteriology (including Tuberculosis)

Director's Office - Bacteriology and Enteric Diseases

The Director's Office of the Bacteriology and Enteric Diseases Division plays a central role in forging national and international partnerships and networks aimed at strengthening surveillance programs and enhancing the laboratory capacity to identify, characterize and assess bacterial diseases. The Office also supports national and international food safety initiatives and contributes to the prudent use of antibiotics, thereby promoting health, preventing illness and reducing disease burden.

The Director's Office is supported by administrative and scientific support staff who:

- coordinate bacteriology laboratory activities within NML/PHAC on a national and international basis;
- disseminate information such as annual reports to provincial / territorial directors;
- administer and maintain scientific information for its program; and
- develop, implement and maintain its various database systems.

2014-15 Goals, Activities / Outputs

Goal #1 Demonstrate national leadership through collaborations with internal and external stakeholders.

Activities / Outputs

1.1 Maintain an overall Quality Management System for Bacteriology and Enteric Diseases Program by:

- conducting internal and external proficiency programs;
- maintaining training in quality assurance systems; and
- expanding ISO accreditation to include more tests.

1.2 Enhance capacities, proficiencies and quality assurance programs of F/P/T laboratories through the CPHLN by:
- improving communication and co-ordination with P/T laboratories;
- engaging in collaborations with P/T stakeholders;
- serving on sub-committees to enhance collaborations and improve efficiencies;
- conducting training and on-site visits to improve P/T laboratory capacity and standardization of methodologies for surveillance and research; and
- hosting national and international meetings.

1.3 Oversee surveillance systems for bacterial diseases, continue to improve infrastructure and resources (informatics, laboratory capital, human resources), and develop strategic plans to support / enhance systems through the integration of laboratory databases and sharing of laboratory and epidemiologic information.

Goal #2 Reduce the burden of illness associated with specific human pathogens through national surveillance activities.

Activities / Outputs

2.1 Conduct assessments and analyses of bacterial pathogens to provide information on the roles and virulence attributes of pathogens affecting human health in Canada.

2.2 Improve the timeliness and efficiency of data collection systems for use in establishing baselines, trends and exposure risks.

2.3 Assess population data to generate relevant information for stakeholders to make recommendations, guide strategic interventions, and inform prevention and control measures by:
- contributing to the development of new national public health programs (for policy, education, and the integration of laboratory and epidemiologic data);
- identifying current and past trends to help improve outbreak response times;
- providing an accessible knowledge base to answer questions from epidemiologists and other public health stakeholders; and
- serving on inter-departmental committees.

2.4 Assist in the development and implementation of surveillance systems for bacterial diseases, including improving infrastructure and supporting / enhancing web-based tools available through the Canadian Network of Public Health Intelligence (CNPHI).

2.5 Improve resources linkages and enhance communication and co-ordination between laboratory and epidemiology systems through web-based tools such as CNPHI.

Goal #3 Ensure credibility and excellent quality of public health testing services for bacterial pathogens.

Activities / Outputs

3.1 Maintain and expand accreditation of laboratory operations and facilities under ISO 17025 standards through:
- the development of additional SOPs to strengthen the laboratories' quality management system for reagents, equipment, test procedures and training plans;

- the internal monitoring of competencies to support the continuous improvement of NML internal and external quality assurance processes; and
- participation in national and international proficiency programs (e.g., with the CDC and WHO) to ensure the highest levels of laboratory competence.

Goal #4 **Provide scientific evidence and support through reference, surveillance, and research activities, to guide public health assessments, decision-making and actions.**

Activities / Outputs

4.1 Review research and current laboratory data to provide recommendations on appropriate typing methods, recognizing case clusters, identifying case linkages and assisting trace-back activities.

4.2 Prepare and review scientific communications publications including the peer review of journal articles and position papers.

4.3 As part of NML and PHAC strategic priorities, develop cutting-edge technologies, generate program data, and foster research collaborations with internal and external partners.

Goal #5 **Demonstrate international leadership through collaboration, training and research activities.**

Activities / Outputs

5.1 Facilitate laboratory cross-training programs between NML sections, between NML and Canadian partners, and between NML and International partners.

5.2 Assist in the development of laboratory capacity, proficiency and expertise to enhance global public health by participating in WHO, PHAC, CIDA and PAHO committees / working groups.

5.3 Provide expertise and guidance to strengthen international relationships by supplying strains, reagents and standardized protocols; assisting global surveillance efforts; and attending / presenting at international conferences.

Enteric Diseases

The Enteric Diseases Section, led by Acting Section Chief Dr. Celine Nadon, identifies and characterizes enteric pathogens and emerging infectious enteric diseases affecting humans.

Key clients and stakeholders include all provincial public health laboratories, CFIA, AAFC, LFZ and CFEZID.

The section's objectives address broader NML core functions and focus on achieving public health outcomes through integrated and interdependent activities related to:

- ✓ preventing and controlling foodborne and waterborne illnesses (e.g., *E. coli, Salmonella*) through rapid, accurate, and **comprehensive characterization** of the causative agents (*reference services*)
- ✓ providing **laboratory-based surveillance**, for the identification of pathogen distribution and associated risk factors to inform prevention and control strategies (*surveillance*)

- ✓ coordinating and participating in **national and international investigations** of enteric diseases to identify the microbial hazards and reduce human exposure to these hazards (including leadership of the PulseNet Canada program) (*outbreak response*)
- ✓ conducting **research** focussed on performing pathogenomic studies and improving the capacity for pathogen detection / isolation, and translating these findings and novel platforms to the CPHLN, PHAC and throughout the federal Health portfolio *(research)*

Through its efforts, the Section works to strengthen early detection and enable faster response to potential foodborne illness outbreaks. The Section plays an important role to provide sound and credible evidence to support decision-making, both nationally and internationally, to limit the potential exposure of Canadians to hazards in food products, reduce the number of associated illnesses, and mitigate associated economic impacts.

2014-15 Goals, Activities / Outputs

Goal #1 Support prevention, control and monitoring efforts by providing laboratory diagnostics and reference testing services for enteric bacterial diseases.

Activities / Outputs

1.1 Determine the burden of enteric diseases by characterizing enteric organisms by genus, species and subtype to identify trends, incidence, prevalence, exposure risks, and etiology of the disease. Outputs include:
- performance of over 10,000 individual tests annually and used for National Enteric Surveillance Program and PulseNet Canada surveillance programs on an ongoing basis, including weekly NESP and PulseNet Canada surveillance reports

1.2 Provide F/P/T stakeholders with comprehensive ISO-accredited reference services for typing and identification methodologies for all tests.

1.3 Administer the quality system for the PulseNet Canada network, including certification and proficiency testing.

Goal# 2 Enhance the response capacity to protect Canadians during outbreaks and emerging enteric diseases, including food and water safety.

Activities / Outputs

2.1 Lead laboratory outbreak response for enteric bacterial disease within the Agency, including point of contact with outbreak epidemiologists.

2.2 Develop / implement novel communications technologies to improve the timeliness of data sharing across jurisdictions to reduce the impact of outbreaks, including use of CNPHI to summarize / analyze outbreak data (DataFuse to be implemented by December 2014).

2.3 Provide co-ordination in epidemiological investigations and laboratory data to support trace-back investigation, interventions and contaminated product recalls with health partners such as CFIA/AAFC/HC.

2.4 Contribute to periodic updates of Health Canada Weight of Evidence: Factors to Consider for Appropriate and Timely Action in a Foodborne Illness Outbreak Investigation (Timeline: new version of the document April 2014).

2.5 Collect, analyze, assess risk, and translate information collected in other countries for warning of emerging issues and international enteric disease outbreaks, through international networks (e.g., WHO, PAHO, CDC).

Goal# 3 **Contribute to improvements in enteric disease prevention and control through applied and discovery research.**

Activities / Outputs

3.1 Develop improved laboratory typing methods to rapidly and accurate diagnosis foodborne disease for some of the most prevalent foodborne microbial contaminants such as *Campylobacter* and *Salmonella*, with the goal of being able to track these microbes between the farm, to food production facilities, to food products and finally to cases of human illness.

3.2 Develop new and innovative laboratory technologies to provide substantially enhanced laboratory identification of microbes. These methods will also seek to:

- increase sample throughput and testing capacities;
- decrease turnaround times for reporting test results;
- reduce response times to sudden public health events; and
- reduce costs over the long term.

Outputs include development of PulseNet Canada infrastructure for Campylobacter CGF by December 2014.

3.3 Conduct research to obtain a detailed understanding of how foodborne microbes cause disease in humans, which is critical during an outbreak of a foodborne disease, particularly if caused by an emerging or novel pathogen. As these are discovered, it will be possible pinpoint and response to those environmental and foodborne microbes that are a risk to humans. Specific research activities will include:

- characterizing complete virulence gene sets in pathogens;
- identifying new virulence genes and genetic elements used as epidemiological markers;
- studying virulence gene flow within and between populations of enteric bacteria (including bacteriophage and plasmids); and
- characterizing virulence gene sets and phenotypes responsible for long-term or chronic sequelae associated with enteric disease.

3.4 Regularize NML's use of whole-genome sequencing during public health events to guide investigations and responses. Microbial fingerprint data can be used to pinpoint patients ill with the same pathogen, and then traced back the source by matching to the fingerprint of pathogens isolated from food / water samples. High-throughput genomics can enhance the diagnosis, surveillance and control of disease through vastly improved molecular epidemiologic investigation of clinical, food and environmental bacterial isolates. Application of whole genome sequencing for real-time surveillance will be addressed by pilot projects to be completed by 2015.

3.5 Translate knowledge and enhance communication to different stakeholders by:

- responding to queries from public health stakeholders; and
- generating reports / publications concerning enteric disease in Canada to help shape policy, guide prevention / control strategies, investigate food safety issues, and undertake public health interventions.

Goal #4 **Reduce the overall incidence and impact associated with enteric diseases through integrated national surveillance activities.**

Activities / Outputs

4.1 Utilize enterics-related surveillance applications such as NESP and PulseNet to collect, analyze, and disseminate laboratory surveillance data (include establishing baseline rates) for foodborne and waterborne

pathogens systems as well as antimicrobial resistance. Outputs include weekly, quarterly and annual reports.

4.2 Integrate surveillance data from multiple sources (e.g., CIPARS, PulseNet, FoodNet Canada) to assist development of public health policy and other actions with PHAC-CFEZID.

4.3 Integrate and effectively use foodborne and waterborne pathogen surveillance data to strengthen and fill gaps in the surveillance capacity by:

- undertaking timely detection, assessing the risk, and estimating the disease burden of emerging bacterial pathogens and foodborne and waterborne parasites;
- identifying high risk food-borne pathogens for development of F/P/T food and water safety policies and interventions;
- estimating the relative importance of different pathogens to ensure proper resource allocation; and
- creating pilot sentinel surveillance sites in collaboration with C-EnterNet and CPHLN.

4.4 Implement the first stage of PulseNet Canada Genome: completion of Retrospective 1000 sequencing project and prospective Listeriosis sequencing project. Outputs include completion of project report with preliminary interpretation criteria scheduled for 2015.

4.5 Perform molecular subtyping-based surveillance on enteric bacterial diseases via real-time and weekly analyses of all national data and generate intelligence and reports for all partners.

4.6 Perform analysis on molecular subtyping data submitted / uploaded by all PulseNet Canada member laboratories.

4.7 Conduct molecular subtyping on isolates from participating laboratories that either do not have capabilities or require surge capacity.

Goal# 5 Demonstrate national and international leadership in improving consumer safety information and enhancing food / water safety policies through collaborative partnerships and effective knowledge translation.

Activities / Outputs

5.1 Collaborate with, HC, CFIA, AAFC, and other levels of government to address emerging issues by:

- providing timely laboratory information to these health partners;
- participating in joint strategic planning exercises;
- participating in and supporting the CPHLN water and food safety subcommittee; and
- participating in the federal joint VTEC (Verotoxigenic *Escherichia coli*) working group.

5.2 Promote knowledge exchange with international partners (including US-CDC and Europe-Enternet) on laboratory methods, research collaborations and surveillance data.

5.3 Improve consumer safety information and enhance food / water safety policies through collaborative partnerships and effective knowledge translation.

5.4 Provide training to co-op, summer, graduate and medical students, epidemiologists, and provincial, national and international laboratory personnel in:

- enteric bacterial pathogens typing and detection;
- mechanisms of virulence of enteric bacterial pathogens;
- population biology of enteric pathogens, mechanisms of virulence gene flow, contribution of different genetic assemblages to human diseases;

- molecular epidemiology of enteric disease;
- technology transfer of new methods developed in enterics; and
- emergency event management through NML Operations Centre.

5.5 Coordinate and administer effective mechanisms for sharing of national laboratory data and outbreak strain information in real time, during both routine operations and during outbreak identification and response, between PHAC, Provincial Public Health Laboratories, Health Canada and the Canadian Food Inspection Agency, in accordance with the Foodborne Illness Outbreak Response Protocol.

5.6 Coordinate and administer data sharing between PulseNet Canada and other countries / regions in PulseNet International, including implementation of the MOU between PulseNet Canada and PulseNet USA.

5.7 Update the Memorandum of Understanding between PHAC/NML and the thirteen member laboratories of the PulseNet Canada network. Outputs include completion of a new version of the MOU, encompassing new tests including whole genome sequencing, by September 2014.

5.8 Provide technical support and training for F/P/T laboratories.

5.9 Enhance pan-Canadian laboratory capacity by:

- transferring the technology of novel laboratory methods to provincial and federal partner laboratories;
- adopting standardized approaches to laboratory testing across Canada to provide the necessary consistency and accuracy needed to perform outbreak investigations;
- developing comprehensive training through the PulseNet Canada program to assist the nationwide expansion of technical skills and data interpretation knowledge; and
- transferring laboratory methods to agricultural and food safety partners as detected contaminants may be transmitted along the food chain from the farm, to food products, to human illness.

5.10 Strengthen the capacity of the national laboratory network by:

- developing and producing high-quality reagents with QA/QC for identification and typing of enteric pathogens;
- providing non-commercially available reagents to external partners; and
- developing ISO SOPs and external proficiency panels.

Outputs include: shipment of panels of isolates to external partners with accompanying instructions and SOPs annually

Antimicrobial Resistance and Nosocomial Infections

The Antimicrobial Resistance and Nosocomial Infections Section (ARNI), led by Dr. Michael Mulvey, provides reference and diagnostic services to provincial public health and hospital laboratories to support outbreak investigations and confirm antimicrobial resistance in numerous pathogens. The ARNI laboratory also identifies and characterizes antimicrobial-resistant organisms for national surveillance programs involving hospital-, community-, and food / water-acquired infections. In addition, research undertaken and technologies / methodologies developed by the Section serve to influence antibiotic usage and infection control procedures. Together, these activities contribute to a reduction in antibiotic-resistant organisms and disease burden in Canada.

2014-15 Goals, Activities / Outputs

Goal#1 Reduce the incidence and impact of antimicrobial resistance and hospital-acquired infections in Canada.

Activities / Outputs

1.1 Conduct national surveillance of major hospital-acquired organisms, including methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *enterococci* (VRE), carbapenem-resistant Gram-negative organisms and *Clostridium difficile* via the Canadian Nosocomial Infection Surveillance Program (CNISP). This includes:
- susceptibility testing, molecular typing, resistance gene detection, toxin detection;
- maintaining a national database of strain collection and information; and
- preparing client reports, publications and presentations.

1.2 Conduct national surveillance of antimicrobial-resistant organisms causing blood, skin / soft tissue, urinary tract, and respiratory infections in Canadian hospitals (via the Canadian Antimicrobial Resistance Alliance, University of Manitoba collaboration).

Goal#2 Support prevention, control and monitoring efforts by providing laboratory diagnostics, reference services, and training.

Activities / Outputs

2.1 Conduct molecular typing / identification, perform susceptibility testing, and report on major hospital-and community-acquired outbreak organisms, including MRSA, VRE, *Acinetobacter* spp, *Clostridium difficile*, multi-drug-resistant *Enterobacteriaceae*, *Legionella* or any rare or difficult to identify bacterial human pathogen.

2.2 Provide non-culture-based, immunological and molecular-based (PCR) assays to aid in the diagnosis of specific bacterial diseases which are non-culturable (e.g., Whipples' disease agent) or poorly culturable (e.g., *Bartonella*) as well as serological testing for specific respiratory agents (*Chlamydophila* spp.) or *Chlamydia trachomatis* LGV where case-by-case testing is done

2.3 Maintain national databases and collection of bacterial strains for proficiency testing requests, test standardizations, and research purposes.

2.4 Enhance the credibility and excellent quality of testing services, which includes:
- initiating a Laboratory Information Management System;
- developing additional SOPs to strengthen the laboratories' quality management system for reagents, equipment, test procedures and training plans;
- continued expansion of ISO accredition of antimicrobial susceptibility testing using the Sensititre system; and
- participating in national and international proficiency programs.

2.5 Conduct training and providing international assistance, such as:
- training numerous visiting scientists, post-doctoral, graduate, undergraduate (Co-op, Red River College, and FSWEP students), and medical students / physicians.

Goal#3 **Assess the public health impact of antimicrobial use in the human health and agriculture sectors through integrated national surveillance activities.**

Activities / Outputs

3.1 As part of the Canadian Integrated Program for Antibiotic Resistance Surveillance (CIPARS):

- provide a representative, methodologically-unified approach for monitoring trends in the development of antimicrobial resistance by non-Typhi Salmonella isolated from human, animal and food sources;
- monitor changes in minimum inhibitory concentrations (MICs) and determine how they relate to patterns of antimicrobial use in human and agricultural settings, allowing for comparisons with other countries; and
- initiate a pilot study to examine the possible linkage of human ciprofloxacin-resistant *Camplyobacter* infections with food and animal sources.

Goal#4 **Assess the public health impact of antimicrobial-resistant organisms in the community setting.**

Activities / Outputs

4.1 As part of the Northern Antimicrobial Resistance Partnership (NARP), distribute established educational programs for healthcare practitioners and individuals in the community.

4.2 Continue the support in the 2nd and final year of a pilot population-based surveillance system in two Canadian cities to monitor antimicrobial-resistant organisms from community settings, beginning with community-associated, methicillin-resistant *Staphylococcus aureus* (CA-MRSA). This includes monitoring:

- changes in the incidence of symptomatic CA-MRSA infections at the population level;
- the epidemiological patterns and molecular biologic characteristics of CA-MRSA strains within the population of the surveillance areas; and
- possible risk factors for CA-MRSA symptomatic infection and transmission, which may be used to guide the development of community-level infection control and prevention measures.

Goal#5 **Conduct research projects to improve detection and typing of antimicrobial-resistant organisms.**

Activities / Outputs

5.1 Develop novel or improved methods for molecular typing and characterization of bacterial pathogens for surveillance and public health control activities, which includes increasing sample throughput and testing capacities and decreasing turnaround times and costs.

5.2 Conduct research into the molecular characterization of novel / emerging antimicrobial resistance mechanisms, which includes preparing client reports, publications and presentations and establishing reference standards.

5.3 Conduct research into the genetic variability and virulence studies in emerging antimicrobial-resistant organisms. This includes pathogenomic studies of emerging / epidemic strains of MRSA, *C. difficile*, VRE, and ESBL/carbapenem-resistant *Enterobacteriaceae* using a combination of metagenomic, transcriptomics, proteomics, and genome / plasmid sequencing.

5.4 Engage in active collaborations with provincial, national, and international partners (CIPARS, CNISP, CAN-WARD, academia, hospitals and international health organizations).

Goal#6 Promote standardization and accuracy of laboratory testing for emerging bacterial pathogens.

Activities / Outputs

6.1 Establish the Section as a recognized Centre of Excellence that:
- provides expert consultations, investigations, and data collection;
- promotes and facilitates standardization, training and guidelines; and
- promotes improved knowledge and technology transfer with national and international partners.

6.2 Provide operating guidelines, training, molecular typing expertise and assist with proficiency testing, to P/T laboratories for existing or new, emerging bacterial threats.

6.3 Establish and maintain a national biorepository of CL-2 bacterial species for proficiency testing, test standardization and research, including collating, growing, restoring and documenting aging culture collections.

6.4 Distribute upon written request, reagents or rare/unusual genera and species to partner laboratories for use in research or other purposes to CPHLN public health laboratories, for retrieving / compiling test and validation data and for establishing additional exchanges that enhance proficiency test accessibility for rare or esoteric assays.

Streptococcus and STI Unit

Streptococcus and Sexually-Transmitted Infections (STI) Unit, led by Irene Martin, provides reference diagnostics, conducts national surveillance, monitors antimicrobial susceptibilities, provides outbreak support and research activities on Streptococcus *pneumonia.S.pyogenes* and bacterial sexually transmitted infections including *Neisseria gonorrhoeae, Mycoplasma* spp. and *Ureaplanma* spp.

Monitoring the incidences of diseases provides early warning of changing disease patterns (e.g., emerging antimicrobial resistance, possible outbreaks, increases in disease prevalence, serotype monitoring for the assessment and refinement of vaccine formulations) all contribute to public health interventions and a reduction in disease burden in Canada.

2014-15 Goals, Activities / Outputs

Goal#1 Support prevention, control and monitoring efforts for Streptococcus infections and sexually transmitted bacterial infections by providing laboratory diagnostics and reference services.

Activities / Outputs

1.1 Provide timely / accurate laboratory analysis results and/or surveillance data to the CPHLN, provincial public health laboratories, federal and provincial epidemiologists and other clients.

1.2 Contribute to the control and monitoring of *S. pneumoniae* by identification of serotypes responsible for disease and evaluate the impact of new pneumococcal conjugate vaccines on disease burden in order to guide vaccine development.

1.3 Participate in outbreak management for S*. pneumoniae* and *S. pyogenes* by providing molecular epidemiologic patterns and microbiologic characteristic data, personnel and disease-specific expertise.

1.4 Reduce the incidence and impact of antimicrobial resistance in *Neisseria gonorrhoeae* by providing laboratory diagnostics and reference services including antimicrobial susceptibility testing, and *N. gonorrhoeae* multi-antigen sequence typing to ensure the effectiveness of recommended treatments and timely detection of emerging resistance mechanisms.

1.5 Enhance credibility and quality of testing services by maintaining and expanding requirements for ISO 17025 laboratory accreditation.

Goal#2 Reduce the overall incidence and impact associated with Streptococcal infections and sexually transmitted bacterial infections through integrated national surveillance activities.

Activities / Outputs

2.1 Participate in collaborative national and international surveillance activities including the enhanced national surveillance of *Streptococcus* with the:

- Introduction of an enhanced Canadian invasive pneumococcal disease (eIPD) surveillance program, in partnership with the Centre for Immunization and Respiratory Infectious Disease (PHAC) and provincial public health laboratories providing the opportunity to integrate laboratory surveillance with epidemiologic information. This enhanced surveillance is necessary to monitor shifts in invasive pneumococcal disease (IPD) serotypes in response to the introduction of new vaccines in 2010 and link enhanced epidemiological data ie mortality and morbidity, vaccine coverage.
- Immunization Monitoring Program Active (IMPACT) program, a network of Canadian paediatric hospitals monitoring the influence of the pneumoncoccal immunization programs on the prevalence, serotypes and antibiotic resistance patterns of IPD.
- International Circumpolar Surveillance (ICS) program, a network of circumpolar countries monitoring the epidemiology of *S. pneumoniae*, Group A *Streptococcus* and Group B *Streptococcus* which assists in the formulation of prevention and control strategies in the northern populations.
- Support regional surveillance programs such as the Toronto Invasive Bacterial Disease Network (TIBDN) and Calgary Area *Streptoccoccus pneumonia* Epidemiology Research (CASPER)
- Collaboration with University of Manitoba/Health Sciences Centre, Winnipeg, MB to monitor antimicrobial resistance on invasive *S. pneumoniae* isolated from children and adults across Canada.

2.2 Participate in a national, standardized surveillance system, Enhanced Surveillance of Antimicrobial Resistant Gonorrhea (ESAG), in partnership with Centre for Communicable Diseases and Infection Control (CCDIC), that combines epidemiologic and laboratory data to determine the prevalence, trends and types of *N. gonorrhoeae* in Canada to better understand its transmission, monitor antimicrobial resistance levels, detect emerging antimicrobial resistance and develop population-level, evidence-based public health interventions.

Goal#3 **Continue to make improvements in Streptococcus and STI prevention and control, including improving the detection and typing of antimicrobial-resistance through applied and discovery research.**

Activities / Outputs

3.1 Undertake research activities related to the development and improvement of diagnostic methods to:
- improve the algorithms for characterization,
- increase sample throughput and testing capacities,
- decrease turnaround times for reporting test results,
- reduce response times to outbreaks, and
- reduce costs over the long term.

3.2 Develop novel and improved molecular epidemiological tools and advanced molecular techniques such as whole genome sequencing to enhance surveillance and public health control for *Streptococcus* spp

3.3 Develop novel or improved methods for molecular typing such as whole genome sequencing for the characterization gonococcal diseases by:
- Conducting research into the molecular characterization of novel/emerging antimicrobial resistance mechanisms of *N. gonorrhoeae*
- performing molecular epidemiological investigations of circulating antimicrobial resistant *N. gonorrhoeae* strains and investigate antimicrobial resistance markers, (a collaboration with the Centres for Communicable Diseases and Infection Control).

Goal#4 **Demonstrate laboratory leadership nationally and internationally through quality initiatives, collaborative partnerships and effective knowledge translation.**

Activities / Outputs

4.1 Provide proficiency testing and quality assurance services through the *N. gonorrhoeae* antimicrobial susceptibility national proficiency program to provincial laboratories.

4.2 In collaboration with the University of Saskatchewan, provide a proficiency testing program for *N. gonorrhoeae* antimicrobial susceptibility testing to countries in Latin America, including Panama, Chile, Uruguay, Peru, Argentina, Paraguay and Colombia.

4.3 Provide proficiency testing and quality assurance services through the International Circumpolar Surveillance Inter-laboratory for i) *Streptococcus pneumoniae* Serotyping and Antibiotic Susceptibility Testing Quality Control Program and ii) *Streptococcus pyogenes emm* sequencing, to provincial and international laboratories.

4.4 Enhance Streptococcus and Gonococcus surveillance reporting tools using Laboratory Reporting Centre on the Canadian Network for Public Health Intelligence (CNPHI), a secure web-based data and information exchange program that allows access to current data, testing status, on-line charting and enhanced epidemiological surveillance data**.**

4.5 Provide current and up-to-date information in the form of peer-reviewed publications and attending/presenting at international and national conferences.

4.6 Provide training to co-op, summer and medical students, epidemiologists, and provincial, national and international laboratory personnel in:
- genotypic and phenotypic characterization of *Streptococcus* species;
- genotypic and phenotypic characterization of *N. gonorrhoeae*;

- molecular characterization of mutations associated with antimicrobial resistance genes;
- molecular epidemiology of pneumococcal and gonococcal disease.

Syphilis Diagnostics and Vaccine Preventable Bacterial Diseases

The Syphilis Diagnostics and Vaccine Preventable Bacterial Diseases Section, led by Dr. Raymond Tsang, provides laboratory leadership in the detection, identification, prevention and control of some sexually-transmitted and vaccine-preventable bacterial infections (e.g., invasive meningococcal disease, invasive *Haemophilus influenzae* disease, syphilis, pertussis) through reference and diagnostic services. The Section undertakes surveillance and research activities for monitoring disease incidences and patterns, detecting vaccine-resistant mutant strains, monitoring and detecting changes in molecular epidemiology, and participating in disease outbreak response. The Unit also provides expert support for the following national working groups, PHAC's National Meningococcal B Pilot Project Task Group (MBPPTG), which integrates technical and policy recommendations to develop guidance for use of the new **meningococcal B** (MenB) vaccine and the Agency's Multi-Disciplinary Community of Experts on **Pertussis** (MDCOEP)', which is a federal, provincial, and territorial task group formed in response to recent pertussis outbreaks in many regions across Canada.

2014-15 Goals, Activities / Outputs

Goal#1 **Support prevention, control and monitoring efforts for vaccine-preventable and sexually-transmitted bacterial diseases by providing laboratory diagnostics and reference services.**

Activities / Outputs

1.1 Provide laboratory tests, reagents / antisera and methods for disease agents' identification and characterization to provincial public health laboratories, F/P/T epidemiologists and other clients.
1.2 Participate in national and international surveillance activities.
1.3 Provide data and reference / diagnostic services to the national notifiable disease reporting system.
1.4 Participate in outbreak management by providing data, personnel and disease-specific expertise.
1.5 Maintain a national database of strain collection and information.
1.6 Supply research materials to, and collaborate with, Canadian and international government, industry and academic researchers to improve vaccines and diagnostic procedures.

Goal#2 **Contribute to improvements in vaccine-preventable bacterial diseases prevention and control through applied and discovery research.**

Activities / Outputs

2.1 Improve diagnostic and typing methods for agents that cause syphilis, meningococcal, pertussis, and *Haemophilus influenzae* diseases.
2.2 Conduct immunological, antigenic and genetic analysis of *Treponemal pallidum*, *Neisseria meningitidis*, *Bordetella pertussis*, and *Haemophilus influenzae*;
2.3 Develop methods / reagents for characterization of respiratory pathogens.
2.4 Provide laboratory characterization of *Bordetella pertussis* strains causing whooping cough outbreaks and detect potential vaccine-escape

mutants by conducting immunological and genetic analysis of virulence factors of *B. pertussis*.

2.5 Participate and provide leadership in laboratory diagnosis of syphilis through working with Canadian Public Health Laboratory Network's Laboratory Standardization Issue Group.

2.6 Monitor the changing epidemiology of invasive *Haemophilus influenzae* disease by continuing to characterize non-b *H. influenza* strains.

2.7 Prepare for the potential emergence of non-type b invasive *H. Influenzae* disease by collaborating with the National Research Council and the Northern Ontario School of Medicine on a project to examine potential applications of a conjugate vaccine against serotype a *H. influenzae*.

Goal#3 Address gaps in laboratory-based surveillance of sexually-transmitted and vaccine-preventable bacterial infectious agents.

Activities / Outputs

3.1 Support Canada's Immunization Monitoring Program ACTive (IMPACT) research activities on invasive meningococcal and *Haemophilus influenzae* diseases.

3.2 Review current data on *Haemophilus influenzae* serotype a as an invasive pathogen.

3.3 Monitor trend and characterization of non-typeable *Haemophilus influenzae*.

3.4 Characterize newer MenB vaccine antigens in clinical isolates.

3.5 Participate in research programs to improve laboratory diagnostic procedures for different stages of syphilis, in particular neurosyphilis and primary syphilis.

Goal#4 Provide leadership in supporting and ensuring quality results in collaborating with laboratories for reference diagnostic and surveillance work.

Activities / Outputs

4.1 Provide and administer laboratory proficiency program to approximately 70 laboratories in Canada and overseas to ensure quality assurance in the laboratory testing for syphilis.

4.2 Continue to co-administer and provide a quality assurance program for the serotyping of *H. influenzae* and serogrouping of *N. meningitidis* to laboratories involved in the invasive bacterial diseases working group in the International Circumpolar Surveillance Program.

4.3 Provide and share laboratory procedures and reagents with collaborating laboratories.

Goal#5 Provide leadership through co-ordinating meetings, participating in national laboratory task group in the CPHLN and collaborations with national and international partners.

Activities / Outputs

5.1 Co-chair a CPHLN task group that examines laboratory diagnosis of syphilis and participates to develop national guidelines and diagnostics algorithm for syphilis.

5.2 Participate as a member of the national Multi-Disciplinary Community of Experts on Pertussis (MDCOEP).

5.3 Participate as a member of the national Meningococcal B Pilot Project Task Group (MBPPTG).Participate in an international multi-country study to examine the potential coverage of a candidate serogroup B *N. meningitidis* vaccine.

5.4 Participate with national and international research teams to understand the pathogenesis of severe invasive disease caused by non-typeable *H. influenzae* strains.

5.5 Continue to share expertise and knowledge through technology transfer and publication in scientific peer-reviewed journals.

Mycobacteriology

The National Reference Centre for Mycobacteriology (NRCM), led by Ms. Joyce Wolfe, conducts basic research involving a genus of bacteria known as *Mycobacterium*, which includes *Mycobacterium tuberculosis*. In addition, the NRCM provides reference, diagnostic, surveillance and consultative services to laboratories, universities, health care providers and other public health stakeholders across Canada and internationally. As part of these activities, the NRCM operates a national proficiency program which tests and ensures the quality of provincial laboratory technologies for mycobacterial diseases.

2014-15 Goals, Activities / Outputs

Goal#1 Promote standardization and accuracy of laboratory testing for tuberculosis and other mycobacterial diseases in Canada.

Activities / Outputs

1.1 Provide proficiency testing and quality assurance services through the national proficiency program to provincial laboratories.

1.2 Continue to provide international testing standards for MDR-TB (Multiple Drug-Resistant Tuberculosis) and XDR-TB (Extensively Drug-Resistant Tuberculosis) to provincial laboratories.

1.3 Maintain a national biorepository of mycobacterial strains for proficiency testing, test standardization and research.

1.4 Provide guidelines, training and expertise in diagnostic testing procedures requiring Level 3 containment (e.g., real-time detection of *Mycobacterium* species, sequence-based species identification, susceptibility testing, phenotypic and genotypic characterization of isolates) to provincial, national and international Level 3 laboratories, clinical microbiologists and infectious disease physicians.

1.5 Contribute to published standards such as international CLSI and Canadian Tuberculosis Standards.

1.6 Consult with CDC (Altanta) for TB genotyping social networking models. Distribute articles and reading material using the Canadian Tuberculosis Laboratories Technical Network (CTLTN) and PHAC CNPHI network. Host the annual CTLTN meeting to discuss current laboratory and technical issues and biosafety issues.

1.7 Provide training for technology transfers (e.g., molecular targets and genotyping) to provincial partners.

1.8 Establish and maintain national and international testing standards by maintaining and expanding the TB NML program ISO 17025 accredited methodologies.

1.9 Provide online access to the TB Guide to Services to our provincial clients.

Goal#2 **Contribute to a reduction in the incidence and impact of tuberculosis and other mycobacterial diseases through national reference and diagnostic services.**

Activities / Outputs

2.1 Conduct esoteric diagnostic Level 3 containment testing on behalf of provincial and territorial mycobacteriology laboratories including:
- sequence-based species identification;
- susceptibility testing including MDR and XDR tuberculosis isolates with new and investigational antimicrobials;
- rapid molecular detection of drug resistance in MTB
- rapid molecular detection of *Mycobacterium* species from clinical specimens
- phenotypic and genotypic characterization of isolates;
- susceptibility testing of non-tuberculosis mycobacteria; and
- genotyping of *M tuberculosis* and non-tuberculosis mycobacteria.

2.2 Advance diagnostic capacities by consulting and collaborating with experts such as CDC (Atlanta), and the European Union genotyping working group for the development of new standards and technologies.

2.3 Promote timeliness and consistency in data collection by providing/contributing to:
- monthly test turn-around-times reports;
- annual proficiency testing reports;
- annual program testing statistical reports;
- annual TB case tracking report;
- annual antimicrobial resistance reports.

2.4 Provide Canada with emergent response capacity and leadership for TB disease outbreaks.

Goal#3 **Contribute to a reduction in the incidence and impact of tuberculosis and other mycobacterial diseases through national surveillance.**

Activities / Outputs

3.1 Participate in federal initiatives involving cross jurisdictional agencies such as core surveillance of Nationally Notifiable Diseases. The Multilateral Information Sharing Agreement (MLISA) project is an initiative whose goal is to develop and implement health programs and healthy public policies, to evaluate these programs and policies, and to respond appropriately and in a timely-manner to public health emergencies, public health events and outbreaks.

3.2 Maintain national surveillance of *M. tuberculosis* and non-tuberculosis mycobacteria to provide information and support to provincial and territorial partners as well as the PHAC CCDIC. This includes:
- performing genotyping of tuberculosis isolates as an adjunct tool in epidemiological contact tracing and outbreak investigations;
- performing genotyping of non-tuberculosis mycobacteria for detection of non-TB mycobacterial infections and outbreaks investigations;
- contributing to the publication of annual PHAC CCDIC TB case tracking report; and
- contributing to the publication of annual PHAC CCDIC antimicrobial resistance reports.

3.3 Enhance surveillance of drug-resistant tuberculosis such as MDR-TB and XDR-TB by investigating new molecular detection methods and other rapid testing methods to support increasing global demands for rapid technology for TB diagnostics, surveillance and disease control.

3.4 Conduct genotyping of tuberculosis strains and in conjunction with provincial and territorial partners to maintain a national genotyping database to support national and international outbreak response and case tracking. This includes:
- maintaining a CNPHI web board for member communication;
- providing participants with training in techniques and data analysis.
- providing clients with electronic data to maintain current and accurate databases on provincial sites

3.5 Promote standardization of genotyping methods to enable data exchange with international databases for strain characterization and comparison.

3.6 Conduct non-tuberculosis mycobacteria (NTM) disease surveillance, including maintaining a sequencing database and identifying antimicrobial susceptibility patterns.

3.7 Provide knowledge and support to external stakeholders, e.g., social network analysis and cluster analysis.

Goal#4 Contribute to improvements in mycobacterial disease prevention and control through scientific research, teaching and training.

Activities / Outputs

4.1 Participate in a collaborative research effort with CFIA and Parks Canada
- study *Mycobacterium bovis* outbreak trends and monitor potential disease transmission from animals to humans.

4.2 Investigate Genetic Susceptibility to Pulmonary and Latent Tuberculosis (TB) Infection and Disease in a Kenyan Cohort.

4.3 Study associations of the KIR genotyping and HLA typing in TB patients of Canadian born, vulnerable and risk groups, foreign born.

4.4 Study host immune responses to tuberculosis, including virulence factors, genomic, proteomic and in vivo studies; utilize specialized testing to identify unique cases; and assess the impact of the results.

4.5 Develop methodologies for rapid drug sensitivity testing and identify molecular targets for antibiotic resistance.

4.6 Characterize novel and poorly-described Mycobacterium species and maintain a database to track these species.

4.7 Enable shortened treatments of tuberculosis and mycobacterial disease by validating new antimicrobials to be instituted in routine protocols.

4.8 Develop tests for detecting latent tuberculosis infection, made available to national and international partners.

4.9 Provide training for medical infectious disease physicians, graduate students, undergraduate students (i.e., co-op students and visiting scientists).

Goal #5 Engage in active collaborations with the provincial, national and international partners

Activities / Outputs

5.1 Collaborate with partners to study and address tuberculosis related issues, including participation in:
- The Multilateral Information Sharing Agreement (MLISA) project;
- Genotyping Determinants of Tuberculosis Transmission study (with the University of Alberta (CIHR supported));
- Bovine Tuberculosis in elk and transmission to humans (CFIA, Parks Canada, PHAC);
- TB-HIV study group;
- International Circumpolar Surveillance (ICS) Canadian Working Group;

- Northern Public Health Agenda (PHAC and CCDIC);

5.2 Continue on-going collaboration with CCDID to coordinate TB prevention and control efforts in Nunavut in order to:

- assess risks to public health and the economic burdens of TB disease for evidence based decision-making, effective use of public resources and timely response to emerging threats of public health.
- describe TB disease trends, both geographical and spatiotemporal, of confirmed TB cases in Nunavut from 2003 onwards;
- confirm established linkages among TB cases using genotyping results; and
- describe the demographic characteristics of the affected populations and the genotypic characteristics of *M. tuberculosis* strains to develop policies and programs.
- University of Nairobi and Kenyatta National Hospital Collaboration, Kenya;
- TB genotyping program collaboration with CDC; and
- TB genotyping collaboration with European Union partners working group.

Goal#6 Contribute to the improvement of tuberculosis diagnostics as well as vaccine design and evaluation by conducting research on the TB-specific host immune response.

Activities / Outputs

6.1 Collaborate with the National Laboratory for HIV Immunology to facilitate immunology-based TB research locally and internationally.

6.2 Evaluate the Interferon Gamma Release assay within local Manitoba clinics to evaluate their potential ability to improve TB diagnosis

- Assess the utility of the Interferon Gamma Release assay within local Manitoba clinics Together with clinical partners at the University of Nairobi to evaluate the utility of IGRA assay in detecting active and latent TB infection in a highly TB endemic population in Nairobi, Kenya in the context of HIV infection
- Develop improved immunodiagnostics to better diagnose and distinguish active and latent TB infection, a critical goal for public health TB control.

6.3 Evaluate TB-specific immune responses among those co-infected with HIV in order to reveal new biomarkers that better predict and detect TB infection, and compare the sensitivity of those responses to current available assays including the interferon gamma release assay.

- Longitudinally following TB/HIV co-infected individuals and assess TB-specific immune responses over time to reveal immune markers predictive of LTBI reactivation

6.4 Identify parameters of the TB-specific immune response associated with both protection and pathogenesis in various clinical scenarios to provide information contributing to the development of public health interventions such immunotherapeutics and vaccines

- Evaluate TB-specific immune responses pre- and post TB therapy to determine immune correlates of diseases suppression
- Evaluate TB-specific immune responses among individuals with End Stage Renal Disease (ESRD) whom are at high risk for TB reactivation Provide technical support to other PHAC programs and collaborating labs to measure antigen-specific immunity utilizing multiparametric flow cytometry and multiplex cytokine analysis 6.5 A study to identify TB-specific responses of a specialized cell type (“Th17 cells”) known to

play important roles in TB, HIV infection, as well as other inflammatory states such as diabetes. Utilize flow cytometry and milliplex-based studies to describe these immune responses and to correlate immune responses to reactivation of TB in at risk groups. 6.6 Provide technical assistance/training and mentorship to the HIV group at the University of Manitoba as well as members of the National Laboratory for HIV Immunology.

Goal#7 Support and collaboration activities with the Global Indigenous Stop TB initiative in Canadian territorial communities.

Activities / Outputs

7.1 As part of the International Circumpolar Surveillance (ICS) Tuberculosis Working Group, conduct surveillance for targeted public health action and monitor trends in the demographic, clinical and laboratory characteristics of tuberculosis disease in northern circumpolar populations. This includes monitoring TB drug resistance trends and providing feedback regarding the molecular epidemiology of TB in northern circumpolar regions through the use of DNA fingerprinting.

7.2 Provide support and collaboration for Centre for Communicable Diseases and Infection Control (CCDIC) Implementation Plan which is a key component in the prevention and control of communicable diseases for at-risk populations. This includes the following surveillance and research activities:

- policy proposal brief on TB (Policy coordination and Execution Correspondence unit), Integrated Management Services Division, CCDIC – Laboratory capacity and associated data usage and dissemination
- MLISA technical annex on surveillance of TB – on going support and collaboration provided to Policy division of CCDID, PHAC, Ottawa
- Technical schedule for specimen transport for CCDIC
- Membership on MLISA TB expert group
- Assist in Northern Public Health Agenda Implementation Plan for lab capacity, public health knowledge and health prevention and disease control
- providing genotyping analysis to track outbreaks and assist in epidemiological investigations;
- working with TB prevention and control to monitor TB drug resistance; and
- initiating future studies into TB/HIV co-infection in the North.

The collaboration also encompasses the following capacity-building activities:

- providing support to the Iqaluit laboratory as well as appropriate quality control panels for various laboratory procedures;
- developing a comprehensive database for TB genotyping with the Nunavut laboratory;
- providing on-site training on genotyping cluster investigations; and
- maintaining linkages between the University of Winnipeg and the Nunavut Ministry of Health for training laboratory technicians.

7.3 Provide laboratory support and collaboration for the Northern Public Health Project, a program funded by the federal government whose goal is to stem the spread of TB disease in Canada’s northern communities.

BACTERIOLOGY AND ENTERIC DISEASES - Budgets and Staffing

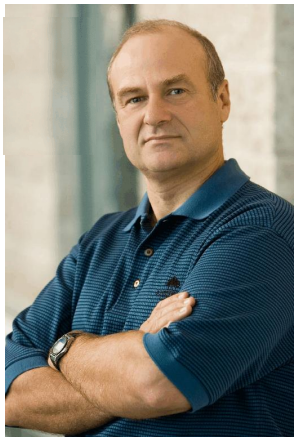
Salary Funding

Annualized Salaries:	$5.964M	(including Food Safety Funding)
Approved FTEs:	73	(including Food Safety Funding)
Vacant Approved Positions:	3	(as at June 30, 2014)

O&M Funding

Allocated Notional O&M:	$2.375M	(includes $575K in Biotech/GRDI and Food Safety Funding)

Zoonotic Diseases and Special Pathogens



The Zoonotic Diseases and Special Pathogens Division, led by Dr. Michael Drebot, is a World Health Organization (WHO) Collaborating Center for Zoonotic Diseases and serves as the national reference laboratory for zoonotic diseases. It comprises the following sections:

- ✓ Special Pathogens
- ✓ Viral Zoonoses
- ✓ Field Studies
- ✓ Rabies, Rickettsia and Related Zoonotic diseases

The Division is both a leader and responder in the identification and control of zoonotic diseases and special pathogens in Canada and worldwide. Housing Canada's only CL-4 laboratory for human testing and CL 3 insectary, the Division works with a range of viral, bacterial and rickettsial zoonotic diseases, including selected rare and emerging pathogens that may be contracted naturally or as a result of a bioterrorism event, e.g., smallpox, West Nile, dengue and other arboviruses, hantaviruses, haemorrhagic fevers agents such as Ebola and Lassa fever viruses, rabies, Lyme disease, Bartonella, Leptospira, Q fever, and Rocky Mountain spotted fever. The Division's core activities include:

- ✓ reference and diagnostic services
- ✓ infectious disease surveillance and field study
- ✓ emergency outbreak preparedness and response
- ✓ applied infectious disease research
- ✓ biosafety training
- ✓ prevention strategy development

Noteworthy contributions of the Division include the development and operation of a National West Nile Virus Surveillance System, adaptable for use with other emerging infectious diseases; the operation of a mobile lab unit that can be and has been deployed to provide emergency field support anywhere in the world; and research aimed at the development of vaccines and antiviral therapy for Ebola, Marburg and Lassa viral haemorrhagic fevers. Through these and other advances, the Division supports provincial, national and international public health partners in tracking, diagnosing, controlling and treating zoonotic and other rare or emerging pathogens.

Director's Office - Zoonotic Diseases and Special Pathogens

The Director of the Zoonotic Diseases and Special Pathogens (ZDSP) Division (Dr. Michael Drebot) manages the ZDSP program, is the Head of the WHO Collaborating Centre for Zoonotic Diseases, participates in committees, conferences and educational activities related to zoonotic diseases, and engages in research undertakings, both nationally and internationally.

2014-15 Goals, Activities / Outputs

Goal#1 **Contribute to improved animal health and vector surveillance for early detection of emerging infectious disease risks.**

Activities / Outputs

1.1 Continue to utilize and engage with expert scientific panels to determine the structure and performance of early warning systems for zoonotic agents in Canada.

1.2 Continue participation in meeting and planning sessions that address One World One Health issues and the establishment of transdisciplinary networks dealing with emerging zoonotic disease.

Goal#2 Contribute to understanding of emerging disease pathogens through scientific research.

Activities / Outputs

2.1 Participate in field-based research studies related to climatic variability, social-ecological changes and dengue infections in Bangladesh. The ultimate goal of this project is to develop an integrated eco-health and adaptive management approach to this disease in Bangladesh.

2.2 Contributes to research initiatives dealing with the study of emerging / neglected arboviruses and their impact on both public and animal health. These involve the determination of infection rates among vectors and reservoirs and the incidence of cases in various regions of Canada.

Special Pathogens

The Special Pathogens Program (SPP), led by Dr. Gary Kobinger, primarily addresses the development of short- and long-term countermeasures to emerging highly pathogenic agents with a particular focus on viral haemorrhagic fever pathogens, such as members of the families Filoviridae, Arenaviridae, Bunyaviridae, Flaviviridae, and Orthomyxoviridae.

The program's work is directed toward improving the Canadian response capacity in public health and biodefense, with emphasis on:

- ✓ developing and enhancing rapid, highly-sensitive and specific diagnostic test systems for laboratory or field use
- ✓ developing the capacity to quickly evaluate the transmissibility of an infectious agent
- ✓ developing single-dose vaccine platforms with a short-time to long-lasting systemic and mucosal immunity
- ✓ clinical therapeutic modalities against infections of interests
- ✓ developing optimal protocols to help guide the management of patients infected with high consequence pathogens in Canadian hospitals.

This work will be achieved through studies on pathogenesis and host immune responses using various animal models and the utilization of reverse genetics systems (minigenome systems and infectious clone systems). SPP also performs molecular and seroepidemiological surveillance on emerging highly-pathogenic agents in Canada and abroad, notably where CL-4 pathogens are endemic (e.g., filovirus in Africa).

2014-15 Goals, Activities / Outputs

Goal#1 **Contribute to Canadian and global preparedness for zoonotic and other viral disease threats, including agents of bioterrorism through enhancements in reference services and diagnostic activities.**

Activities / Outputs

1.1 Develop and enhance rapid, highly-sensitive and specific diagnostic test systems for use in the laboratory or applied in the field, including:
- detection of pathogen-specific nucleic acids;
- detection of pathogen-specific antigens; and
- maintained / enhanced capacity for virus isolation in tissue culture.

1.2 Develop new, or improve existing, field diagnostic assays for on-site diagnostics and develop / enhance field assays for the detection of pathogen-specific antigens through:
- pathogen-specific nucleic acid detection using real-time PCR on a variety of platforms; and
- antigen and antibody detection-based on immunofiltration technology.

1.3 Participate to international coordination efforts for monitoring and responding to outbreaks of highly pathogenic agents (e.g., WHO-EDPLN network).

1.4 Complete the process to acquire accreditation for Hantavirus serology assay to ISO 17025 standard.

Goal#2 **Contribute to improved surveillance of emerging pathogens through studies furthering the understanding of disease prevalence and transmission.**

Activities / Outputs

2.1 Conduct seroepidemiological and molecular studies on humans and potential reservoir species, notably bats, pigs and sheep in Western Africa, Eastern Africa and the Congo basin.

Goal#3 **Contribute to improvements in the prevention and control of zoonotic and other viral diseases through research into new therapies, antiviral treatments and preventive strategies.**

Activities / Outputs

3.1 Develop single-dose vaccine platforms with a short-time to long-lasting systemic and mucosal immunity by continuing development and safety / efficacy testing of vesicular stomatitis virus (VSV), adenovirus, DNA and rabies virus-based vaccine vectors.

3.2 Continue to develop safe and high-throughput tools / systems for the discovery and in vitro / in vivo testing of antivirals against viruses of the families Arenaviridae, Bunyavirirdae, Filoviridae, Orthomyxoviridae and Flaviviridae by developing multiplex assays for detecting and monitoring of highly pathogenic agents.

3.3 Conduct research into the pathogenesis, biology, transmission dynamics and immunology of Level 4 and other highly pathogenic agents noted above by:
- developing tools to study disease in hamsters and guinea pigs; and
- developing animal models to study disease progression and pathophysiology.

Goal#4 **Contribute to Canadian and global preparedness and response capacity for threats of emerging highly pathogenic agents.**

Activities / Outputs

4.1 Advance the mobile lab unit as a national program available to support national and global infectious disease control efforts by:

- adding the new diagnostic technologies described above;
- training staff on response missions, including field exercises;
- developing and making available a mobile clinical testing capacity (capable of evaluating blood gas, electrolytes and other clinical parameters at the bedside) to respond to imported cases of suspected or confirmed haemorrhagic fever virus infection; and
- participating in outbreak responses to highly pathogenic agents (e.g., haemorrhagic fever viruses) following requests from international partners (e.g., WHO, MSF).

Therapeutics and Diagnostics

The Special Pathogens Program's **Therapeutics and Diagnostics** *unit is hea*ded by Dr. James Strong, this section concentrates on clinical aspects of high consequence viral infections such as Ebola and Marburg viruses, this section has developed a high containment Intensive Care Unit (ICU) to be utilized on animal models to research the effects of supportive ICU care, antivirals, immunomodulators and organ specific interventions on the overall mortality/morbidity of these CL-4/3 infections. These studies serve as reciprocal training platforms; 1) teaching medical staff in the protocols of high containment procedures and 2) teaching research staff from our laboratory in the principals of ICU care and management. Through these studies, Canadians exposed to such high consequence infection, either from international travel, bioweapons use, or laboratory exposures will have better chances of survival from these highly lethal agents. Protocols developed may be adapted to field use to assist International partners in medical care during outbreaks of such infections if and when such a need arises

Activities include:

- ✓ developing animal models to study disease progression and pathophysiology
- ✓ developing clinical therapeutic modalities in animal models of infections of interests
- ✓ developing optimal protocols to help guide the management of patients infected with high consequence pathogens in Canadian hospitals
- ✓ developing and making available a mobile clinical testing capacity (capable of evaluating blood gas, electrolytes and other clinical parameters at the bedside) to respond to outbreaks and/or imported cases of suspected or confirmed haemorrhagic fever virus infection

High Containment Respiratory Viruses Laboratory

The **High Containment Respiratory Viruses Laboratory**, headed by Dr. Darwyn Kobasa, is another unit within the Special Pathogens Program. Activities include research to understand the molecular basis of virulence, as well as options for control, of emerging highly pathogenic respiratory viruses. On-going research includes:

- ✓developing molecular approaches to identify viral determinants of pathogenesis

- ✓using proteomic and genomic approaches to study pathogenesis at the level of host responses
- ✓developing and evaluating suitable animal models of infection
- ✓evaluation of conventional and experimental vaccines and antivirals

2014-15 Goals and Activities / Outputs

Goal#1 **Contribute to the prevention and control of influenza virus infections through applied and discovery research.**

Activities / Outputs

1.1 Establish and use mutagenic protocols to generate conventional influenza vaccine seed virus, which include:
- developing rapid vaccine in A/Puerto Rico/8/34 reverse genetics system; and
- producing a low-pathogenicity H5N1 HA gene suitable for vaccine purposes in a PR8 reverse genetics system.

1.2 Development of the following approaches for influenza virus:
- DNA vaccination approaches;
- Live-virus vaccine approaches to study correlates of protection
- VSV-vectored vaccine approaches.

1.3 Evaluate the efficacy of the antiviral drugs like oseltamivir for protection against emerging and pandemic influenza viruses in animal models of infection. Further evaluation includes understanding the role of drug resistance in therapeutic outcome.

Goal#2 **Characterize viral properties that influence ability of viruses to cause severe disease in humans and contribute to pandemic potential.**

Activities / Outputs

2.1 Use a molecular biology / reverse genetics-based approach to analyze viral determinants of pathogenicity in highly pathogenic influenza viruses including 1918 pandemic and avian H5N1 and H7N9 viruses and evaluate in established models of animal infection.

2.2 Use established ferret and guinea pig animal models to evaluate potential for transmissibility in emerging influenza viruses, including the H7N9 and H5N1 strains, to assess pandemic threat.

Goal#3 **Advance understanding of host responses to infection that contribute to severe disease and identify targets for therapeutic intervention.**

Activities / Outputs

3.1 Conduct research to identify host factors / responses contributing to virulence in infection with highly pathogenic viruses. This includes:
- undertaking expression microarray profiling of host responses to highly pathogenic versus non-pathogenic influenza viruses to help identify host responses that correlate with unfavourable outcome in individuals infected with highly pathogenic viruses; and
- evaluating cellular and global host responses to infection with highly pathogenic viruses using proteomic approaches in collaboration with the University of Manitoba (Dr. Kevin Coombs).

Goal#4 **Enhance the research program to study the Henipaviruses (Hendra and Nipah viruses), targeting basic virology, pathogenesis and animal model develop for evaluating disease, vaccines and antivirals.**

Activities / Outputs

4.1 Establish the hamster model of infection that is currently favoured for Henipaviruses.

4.2 Construct and evaluate reverse genetics systems for the Nipah and Hendra viruses as basic research tools for examining determinants of pathogenicity and viral gene function.
4.3 Apply genomic and proteomic approaches to understanding the role of host factors in disease development.
4.4 Develop and evaluate experimental antiviral therapeutics for Henipavirus infections.

Viral Zoonoses

The Viral Zoonoses Section, co-managed by Drs. Robbin Lindsay and Michael Drebot, undertakes applied research as well as surveillance, reference and diagnostic activities aimed at preventing, detecting and treating West Nile and other arbovirus infections in Canada. Areas of focus include the development and application of diagnostic assays, characterization of rodent- and mosquito-borne viruses and their vectors, and the investigation of the role of viral proteins and antiviral candidates in viral replication and immune response.

2014-15 Goals, Activities / Outputs

Goal#1 Reduce incidences of West Nile virus and other arbovirus infections in Canada and internationally through diagnostic services.

Activities / Outputs

1.1 Perform diagnostics on clinical samples from human case investigations, animal specimens and new serosurveys for arboviruses including West Nile, Dengue, Chikungunya and California serogroup viruses.
1.2 Provide direction to public health authorities regarding diagnostics or related issues.
1.3 Provide test reagents, proficiency panels, and technology transfers for arbovirus diagnostics.
1.4 In collaboration with provincial public health departments, perform Canadian serosurvey and disease burden studies for California serogroup viruses and other non-WNV arboviruses.
1.5 Apply serological and molecular diagnostics for the Cache Valley virus, an emerging mosquito-borne arbovirus with potential to cause neuroinvasive disease in humans and livestock.

Goal#2 Contribute to the development and application of state-of-the-art arbovirus diagnostics to rapidly identify infections and circulating infectious agents, including West Nile Dengue, Chikungunya viruses and California serogroup viruses.

Activities / Outputs

2.1 Apply high-throughput sensitive microsphere immunoassays (MIA) for detecting antibody and nucleic acid from flaviviruses, alphaviruses, and bunyaviruses, allowing rapid identification of infections and circulating infectious agents.
2.2 Generate recombinant proteins for ELISA's and MIA's using appropriate expression systems to allow specific front-line identification of circulating arboviruses.
2.3 Implement biosensor / electrical impedance-based assays for the real-time documentation of confirmatory serology (neutralization assays) to provide more rapid turn-around time in the identification of agents and infected individuals.

2.4 Apply novel real-time PCR assays for the detection of under-recognized arboviruses such as Cache Valley and Colorado Tick viruses in human and arthropod specimens.

Goal#3 Contribute to international collaborative efforts in the surveillance and control of arboviruses.

Activities / Outputs

3.1 Collaborative studies with CDC and State laboratories (Eg. NY and Montana) to develop additional diagnostics for the identification of bunyaviruses and carry out surveillance initiatives for these pathogens.

3.2 Collaborative studies with University of Nairobi involving the role of arboviruses in undiagnosed febrile illness in Kenya.

3.3 Co-investigator on Caribbean Eco-Health Program initiative to determine the seroprevalence of arboviruses on a number of Caribbean islands (Antigua-Barbuda, Belize, Bermuda, Dominica, Grenada, Jamaica, Montserrat, St. Kitts-Nevis, St. Lucia, and St. Vicent-Grenadines).

3.4 Collaborative study involving dengue seroprevalence and risk factors for virat exposure in Bangladesh. Co-investigators include Viral Zoonoses-NML, University of Manitoba, and various Dhaka universities and public health institutes.

Field Studies

The Field Studies Section, led by Dr. Robbin Lindsay, conducts passive and active surveillance, field- and laboratory-based investigations and diagnostic testing, aimed at predicting the emergence, controlling the spread, and reducing the public health impact of vector-borne diseases, such as Lyme disease, West Nile virus and Leptospira. The Section places an emphasis on field-based studies of zoonotic disease vectors (e.g., mosquitoes, ticks, deer mice), environmental changes, and disease risk and transmission.

2014-15 Goals, Activities / Outputs

Goal#1 Mitigate the human health impact of vector-borne disease threats by monitoring the prevalence and distribution of selected vector-borne diseases, including emerging infections.

1.1 Track and undertake diagnostic testing of mosquitoes, ticks and other vectors of zoonotic disease agents in Canada as part of ongoing passive and active surveillance programs as well as in outbreak situations.

1.2 Perform human diagnostics for zoonotic agents including Lyme disease, Tularaemia, Anaplasma, Leptospira and Bartonella species submitted as part of routine diagnostics and those associated with outbreak investigations.

1.3 Provide reference services for the detection of zoonotic agents, which include:

- developing assay and reagent to detect of zoonotic disease agents, including emerging variant strains of select zoonotic disease agents;
- providing quality assurance and external proficiency panels (e.g., WNV and Eastern Equine Encephalitis Virus (EEEV) in mosquito pools) to client laboratories;
- continuing to evaluate new diagnostic platforms or tests for selected agents as they become available and providing advice to provincial laboratories on most appropriate diagnostic platforms, in 2014 efforts will be targeted towards an evaluation of diagnostic platforms of serological testing for the agent of Lyme disease;
- continuing to bring all diagnostic testing performed on human samples under a quality system and ultimately accrediting each of these tests to ISO 17025 standards for serological assays for Lyme disease and initiating the process for Leptospira, Bartonella, Anaplasma and Tularaemia; and
- participating in external proficiency testing for all of these zoonotic disease agents.

1.4 Conduct field-based studies to investigate new and expanding foci for Lyme disease in various parts of Canada including; Manitoba, Ontario and Atlantic Canada and use the resulting data to make local risk assessments and to determine factors limiting human disease risk throughout Canada.

1.5 Conduct field investigations when needed (i.e., when human cases occur in new regions or in unusual clusters) into occurrence of new foci of human cases of hantavirus pulmonary syndrome which includes both field (rodent collections) and laboratory components (serology and molecular diagnostics on collected samples).

1.6 Continue to conduct comprehensive field studies including: serosurveys in humans and companion animals and wildlife to gain a better understanding of transmission dynamics and risk factors for West Nile virus and Eastern equine encephalitis virus infection. These field studies will assist in decision-making regarding the need for intensified mosquito control measures or other public health interventions.

1.7 Continue to develop recombinant proteins for ELISA assays using appropriate expression systems, in 2014 we hope to develop recombinant antigens for use in a Powasson encephalitis serological assay.

Goal#2 Reduce human risk of exposure to selected zoonotic diseases through effective mitigation strategies.

Activities / Outputs

2.1 Continue on-going, longer-term studies to evaluate the overall efficacy and cost-effectiveness of several tick control strategies in Manitoba and Nova Scotia to control blacklegged tick populations and reduce risk of human exposure to infected ticks.

2.2 Complete telephone survey initiated in 2012 to gain a better understanding of how knowledge and practices with respect to rodent control may influence human exposure to rodent-borne pathogens such as the agent of hantavirus pulmonary syndrome.

Goal#3 **Predict the current and anticipated risk of exposure to selected zoonotic pathogens and their vectors in Canada and potential changes in risk associated with climate change.**

Activities / Outputs

3.1 Provide data and expert opinion into a modelling project designed to develop current Pan-Canadian risk maps for animal and human exposure to the emerging pathogens (such as EEEV, Powassan encephalitis virus, *Babesia microti* and *Ehrlichia muris*) as well as projections on how infection or pathogen activity patterns might change as a result of climate change.

3.2 Complete on-going laboratory-based evaluation of the vector competence (for both horizontal and vertical transmission) of selected mosquito species from Canada to maintain and transmit Rift Valley Fever Virus. RVFV). Broaden the spectrum of these studies to also examine the potential interaction between RVFV and similar Bunyaviruses such as Cache Valley Virus which is endemic throughout much of Canada (i.e., could there be genetic reassortments between these related viruses if they infect the same vector or host animal and how might this impact pathogenicity, fitness, etc.).

Rabies, Rickettsia and Related Zoonotic Diseases

The Rabies, Rickettsia and Related Zoonotic Diseases Section is headed by Dr. Heidi Wood. The Section undertakes research, surveillance and diagnostic activities for rickettsial diseases, a family of bacterial pathogens that can be transmitted to humans by ticks, fleas, lice and mites (e.g., typhus, rickettsialpox, African tick bite fever, Rocky Mountain spotted fever) or by other transmission routes. This section also performs primary diagnostic testing for Q fever, a zoonotic infection endemic in Canada, and serology for the detection of antibodies to rabies virus in humans.

The Section's efforts focus on:

- ✓ reducing the risk to humans of exposure to rickettsial diseases and enabling accurate laboratory diagnosis and appropriate treatment in cases of rickettsial infection
- ✓ enhancing a research program with the goal of increasing our understanding of the pathogenesis of rickettsial infections
- ✓ serological testing for detection of antibodies to rabies virus in pre- and post-exposure patients and implementation of molecular assays for the detection of rabies virus in suspected human cases

2014-15 Goals, Activities / Outputs

Goal#1 **Support prevention, control and monitoring efforts by providing laboratory diagnostics and reference services for rickettsial diseases, Q fever and rabies.**

Activities / Outputs

1.1 Provide primary serological and molecular diagnostic testing for the detection of rickettsial agents and *Coxiella burnetii* in human, animal and tick specimens.

1.2 Provide rabies virus-neutralizing antibody titre testing in humans for both pre- and post-exposure vaccination situations and for suspected clinical rabies cases.

1.3 Provide direction to public health authorities regarding diagnostic testing results and related issues.
1.4 Develop and validate molecular diagnostics for detecting rabies virus in clinical specimens from humans for diagnostic and epidemiological investigations.
1.5 Participate in national and international proficiency programs to ensure highest levels of laboratory competence.
1.6 Generate antigens for serological detection of emerging rickettsial pathogens in humans and animals.
1.7 Generate polyclonal antibodies for the detection of rickettsial pathogens in humans and animals.

Goal#2 Contribute to improved public health surveillance for early detection of Q fever, rickettsial infections and emerging rickettsioses.

Activities / Outputs

2.1 Conduct studies to evaluate the prevalence of rickettsial agents in tick and rodent populations in Canada as part of passive and active surveillance programs.
2.2 Conduct studies to evaluate the prevalence of rickettsial agents in human populations within Canada and in collaboration with other countries.

Goal#3 Contribute to the understanding of the biology of rickettsial diseases and rabies virus through scientific research.

Activities / Outputs

3.1 Maintain and expand a culture collection of reference strains for research studies in the CL-3 laboratory.
3.2 Continue a collaborative research program to investigate the mechanisms of pathogenesis of rickettsial agents and rabies virus by:
- conducting studies to determine the immune evasion strategies used by *C. burnetii* to establish chronic infections in animals and humans;
- optimizing a reverse genetics system for rabies virus and development of vaccines using this vector; and
- conducting collaborative research on the pathogenesis of rabies virus and the role of the phosphoprotein in neuronal dysfunction.

Goal#4 Enhance the response capacity to protect Canadians during outbreaks of rickettsial diseases and Q fever.

Activities / Outputs

4.1 Evaluation of commercial assays for Q fever serology for high-throughput testing required for surge capacity.
4.2 Evaluation of new commercial assays for scrub typhus (*Orientia tsutsugamushi*) serology.

ZOONOTIC DISEASES AND SPECIAL PATHOGENS - Budgets and Staffing

Salary Funding

Annualized Salaries:	$2.416M	
Approved FTEs:	27	
Vacant Approved Positions:	2	(as at June 30, 2014)

O&M Funding

Allocated Notional O&M:	$1.089M

Viral Diseases

The Viral Diseases Division, led by Dr. Tim Booth, is the national reference laboratory for viral diseases and comprises the following sections:

- ✓ Viral Sexually-transmitted Diseases and Exanthemata
- ✓ Influenza and Respiratory Viruses
- ✓ Poxviruses
- ✓ Diagnostic Imaging and Microscopy
- ✓ Bloodborne Pathogens and Hepatitis
- ✓ Enteroviruses and Enteric Viruses

The Division's core activities include:

- ✓ Providing diagnostics and reference services, and carrying out laboratory surveillance, for disease due to viral agents such as:
  - hepatitis viruses A-E,
  - respiratory viruses and influenza,
  - viral exanthemata (rash-causing viruses such as chickenpox and measles),
  - viral STDs (including herpes simplex, human papilloma and polyoma viruses), and
  - enteroviruses (including polio virus, coxsackie viruses, and echo viruses, that can cause diseases such as flaccid paralysis, cardiomyopathy, hand-foot-and-mouth disease, and aseptic meningitis).
- ✓ Diagnosing disease due to viral gastroenteritis agents, such as norovirus and rotavirus.
- ✓ Carrying out surveillance and research into the molecular biology and epidemiology of viral agents - performing applied research to develop improved diagnostic tests and basic research of a fundamental nature to understand the pathogenesis of these viruses.
- ✓ Isolating and characterizing new or unknown virus infections which include providing a unique nationally- and internationally-recognized laboratory reference service to Canadian and other national laboratories, for the diagnosis or characterization of unusual or difficult patient specimens or isolates of infectious agents.
- ✓ Monitoring drug-resistant strain of viruses, and carrying out surveillance on vaccine effectiveness and immune breakthrough.
- ✓ Contributing to FluWatch and the WHO influenza surveillance program through antigenic characterization of circulating influenza and monitoring other respiratory virus infections.
- ✓ Engaging in disease surveillance, particularly for bloodborne, vaccine preventable and community-acquired infectious agents which have the risk of being transfused into patients or expanding rapidly in high-risk populations. This work impacts Canadians' overall blood safety and research on emerging pathogens which may be a new or unrecognized threat to humans.

Viral Exanthemata and Sexually-Transmitted Diseases

The Viral Exanthemata and Sexually-Transmitted Diseases (STD) Section, led by Dr. Alberto Severini, carries out reference and research for human papilloma virus (HPV), herpes simplex virus (HSV), and human polyomavirus. The Section also provides reference services for the Epstein Barr virus, and other human herpesviruses, polyomaviruses and Chlamydia. Activities include testing for surveillance, molecular epidemiology, genotyping and comparative genomic studies of viruses, antiviral resistance, transplantation-related testing for herpesviruses, investigations of encephalitis and serology to improve the diagnosis and treatment of viral STDs.

The Measles Mumps and Rubella (MMR) Laboratory, managed by Ms. Joanne Hiebert, undertakes reference and research activities on measles-, mumps- and rubella- virus. Reference services incorporate serological and molecular methods in support of both surveillance and diagnostic activities. The (MMR) Laboratory is a WHO-accredited Regional Reference Laboratory for the WHO and PAHO Measles and Rubella Laboratory Network.

2014-15 Goals, Activities / Outputs

Goal#1 **Contribute to the surveillance, detection and prevention of human papillomavirus (HPV) infection.**

Activities / Outputs

1.1 Perform molecular typing of HPV and provides HPV typing capacity for post-vaccine surveillance studies and studies on HPV screening in Canada.

1.2 Provide reference and proficiency services for HPV diagnostics and surveillance to laboratories involved in HPV testing, which includes:
- developing standardized samples;
- providing reference and confirmatory HPV genotyping to provincial laboratories.

Goal#2 **Contribute to the control of HPV through post-vaccine surveillance.**

Activities / Outputs

2.1 In collaboration with PHAC's Centre for Immunization and Respiratory Infectious Diseases (CIRID), design and set up surveillance programs and participate in provincial and national surveillance programs established as part of the approval process for the HPV vaccine, which includes:
- typing of specimens for HPV;
- transferring and training in HPV testing methods;
- providing confirmatory testing and reference services for laboratories engaged in surveillance activity;
- leading or participating in working groups and workshops on HPV surveillance; and
- collecting typing data.

2.2 Participate in national and international research on HPV epidemiology and diagnostics through the following planned and ongoing research projects requiring HPV typing and reference testing, including:
- HPV in archival cancer specimens in Manitoba (Cadham Laboratory);
- HPV self-sampling in First Nation Communities in the Thunder Bay area (CIHR, Lakehead University).
- LSIL management study in Manitoba (Cadham Laboratory)
- Post vaccine surveillance in Newfoundland and Labrador (Memorial University)

- Post vaccine surveillance in abnormal pap in Alberta (Alberta ProvLab)

Goal#3 Contribute to the control of polyomavirus infection.

Activities / Outputs

3.1 Provide reference services for the BK and JC virus detection in transplant and HIV patients.

3.2 Provide a standardized proficiency panel for quantitative PCR testing of polyomaviruses.

3.3 Provide training and technology transfer for polyomavirus detection.

3.4 Provide reference testing for emerging human polyomaviruses.

Goal#4 Contribute to the control human herpesvirus infection.

Activities / Outputs

4.1 Provide reference and confirmatory testing for HSV serology and for HSV detection by PCR.

4.2 Provide genotypic testing for human cytomegalovirus and HSV antiviral resistance.

4.3 Provide confirmatory testing for EBV serology for provincial / regional laboratories.

4.4 Provide reference testing for EBV nucleic acid assays for provincial / regional laboratories.

4.5 Provide molecular diagnostic for HHV6 and HHV7.

4.6 Provide wild-type vs. vaccine-strain differentiation (PCR) for Varicella zoster virus.

4.7 Conduct research of pathogenesis of herpes virus infections through the following research projects:

- genomics of simplex viruses,
- transcription of pathogenesis genes in simplex viruses, and

Goal#5 Contribute to the control of *Chlamydia trachomatis* infection.

Activities / Outputs

5.1 Provide genotyping and reference testing for Chlamydia for the identification of serovars, especially in the context of the enhanced surveillance program for *lymphogranuloma venereum*.

5.2 Implement and manage a proficiency program for LGV testing in provincial laboratories.

Goal#6 Contribute to the reduced incidences and elimination programs for measles, mumps, and rubella viruses in Canada through surveillance activities.

Activities / Outputs

6.1 In collaboration with PHAC CIRID participate in the national surveillance program for measles and rubella

- Provide genotyping of sporadic cases and outbreaks of measles, mumps and rubella, as part of the surveillance supporting the measles and rubella elimination efforts in the Americas.
- Assist the provinces for molecular testing of measles, mumps and rubella, by providing protocols and proficiency panels, and provide diagnostic assistance in case of outbreaks
- Contribute to the development of guidelines and reports to PAHO
- Work to improve the communication and data flow of genotype surveillance data for example by contributing the Measles and Rubella Weekly Report and Annual Report generated for CIRID.

6.2 Provide reference diagnostic services for:
- measles, i.e., IgM and IgG serology, molecular diagnostics (RT-PCR) and measles SSPE serology;
- rubella, i.e., IgM and IgG serology, molecular diagnostics (RT-PCR), and rubella IgG avidity serology (for confirming primary rubella infection in pregnant women); and
- mumps, i.e., IgM and IgG serology, molecular diagnostics (RT-PCR).

6.3 Publish the data on measles, mumps and rubella molecular epidemiology in Canada.

6.4 Provide expert advice to internal PHAC and external clients on laboratory diagnostics, surveillance and quality assurance / control issues for MMR through consultations and participation in meetings and working groups.

6.5 As a WHO regional measles/rubella laboratory, contribute to international initiatives for measles and rubella control and elimination through participation in PAHO and WHO global measles and rubella lab network activities.

6.6 Develop and provide gold standard testing for MMR serology and participate in national serosurvey studies (e.g. iCARE)

6.7 Evaluate and develop new assay for measles testing, vaccine strain detection and rubella avidity.

6.8 Conduct research on measles mutation rate during outbreaks and develop extended genotyping methods to prepare for molecular surveillance under the measles elimination stage.

Influenza and Respiratory Viruses

The Influenza and Respiratory Viruses Section, led by Dr. Yan Li, carries out fundamental and applied research relating to the diagnosis and pathogenesis of influenza and other respiratory viruses, including new emerging respiratory pathogens. The principal aims of the Section are to conduct surveillance and develop / evaluate methods for the diagnosis, prevention and effective management of viral respiratory diseases. As a designated WHO influenza reference centre, the Section participates in global surveillance of influenza viruses.

2014-15 Goals and Activities / Outputs

Goal#1 Contribute to the overall prevention and control of influenza viruses.

Activities / Outputs

1.1 Study the evolution and molecular epidemiology and characterize the molecular evolution of influenza viruses by:
- sequencing and analyzing HA and NA genes of representative influenza isolates; and
- providing representative Canadian influenza isolates sequence to NML's internal and external stakeholders (e.g., CIDPC, F/P/T health officials, CDC and WHO).

1.2 Conduct antigenic and genetic characterization of influenza viruses to:
- detect, describe changes and support reporting to internal and external stakeholders (e.g., CIDPC, F/P/T health officials, CDC and WHO); and
- contribute to global influenza surveillance and annual vaccine selection by providing Canadian influenza strain to WHO and CDC.

1.3 Build provincial capacity and enable national quality assurance of influenza virus identification by providing stakeholders with:
- reference antisera and viruses;

- influenza diagnostic reagents (Flu Kits); and
- proficiency panels for influenza virus isolation and identification and molecular sub-typing.

1.4 Conduct serosurveys and assess protection levels in selected Canadian populations to evaluate vaccine effectiveness.

1.5 Evaluate vaccine immunogenicity as member of the PHAC/CIHR Influenza Research Network (PCIRN) for the rapid clinical trial group.

1.6 Maintain a national reference collection of influenza virus isolates and antisera.

1.7 Participate in the FluWatch program to timely distribute influenza surveillance data to internal and external stakeholders (e.g., NML, CIDPC, F/T/P health officials, CDC and WHO).

Goal#2 Limit the emergence and transmission of drug-resistant influenza viruses.

Activities / Outputs

2.1 Develop and optimize drug susceptibility assays for monitoring and identifying drug-resistant influenza strains for the anti-influenza inhibitors Oseltamivir, Zanamivir and Amantadine.

2.2 Conduct surveillance, monitor field isolates, characterize and detect drug-resistant strains, and use data for implementing control strategies to limit the emergence and transmission of drug-resistant viruses.

2.3 Enhance the national capacity for drug surveillance through technology transfers to provincial / regional laboratories including:

- providing technical support, including assay protocols, reports, guidelines and recommendations for Amantadine, Oseltamivir and Zanamivir susceptibility testing; and
- providing training in drug susceptibility assays.

Goal#3 Enhance national capacity for the detection and control of pandemic influenza viruses.

Activities / Outputs

3.1 Produce reference antigens and antisera for the antigenic identification of the pandemic strain.

3.2 Develop new molecular and serological methods for the rapid detection of influenza viruses (H5N1, H7N3 and all subtypes of influenza A).

3.3 Provide enhanced reference / diagnostic services to PHLs on emerging influenza Pandemic H1N1, H5 and H7 viruses for identification, investigation, and prevention of unidentifiable and/or new emerging respiratory pathogens.

3.4 Develop, recommend and update molecular diagnostic reagents to novel pandemic influenza strain by:

- providing new molecular proficiency panels, technical support, and reagents to PHLs to enhance their capacity; and
- evaluating and assisting in the performance of proficiency testing for national quality assurance of influenza surveillance.

3.5 Provide sequence information of newly emerging strains of influenza virus.

3.6 Monitor and identify potential pandemic influenza strains by following the antigenic and molecular evolution of a pandemic influenza strain.

3.7 Monitor the performance of diagnostic assays over time to ensure they are effective in identifying the potential pandemic strain.

3.8 Provide training in influenza molecular subtyping to enhance the capacity for rapidly detecting pandemic influenza.

3.9 Implement surge capacities by training all staff in all prioritized assays (human avian influenza, microneutralization and drug susceptibility testing) and establish a stockpile to allow for up to 16 weeks of interrupted supply chain.

Goal#4 Enhance national capacity for the detection and control of other respiratory viruses.

Activities / Outputs

4.1 Develop a real-time PCR assay for the detection of the newly-identified respiratory pathogens MERC-CoV.

4.2 Enhance national capacity through technology transfers to provincial public health laboratories by providing diagnostic reagents, technical support, reference testing and training to detect MERS-CoV, HMPV, HC0V-NL63, HBOV as well as RSV, parainfluenza viruses 1-4 and adenovirus.

4.3 Provide molecular typing of human adenovirus to help guide therapeutic and disease prevention strategies and aid epidemiological investigations, which includes monitoring circulating adenovirus strains and identifying genotypes associated with increased risk of severe disease.

Goal#5 Support international influenza control activities.

Activities / Outputs

5.1 Support global surveillance and vaccine selection by providing Canadian data and representative strains to the WHO and CDC.

5.2 Participate in WHO outbreak investigation activities by deploying NML mobile lab team.

5.3 Provide international counterparts with training and technical support in influenza surveillance and diagnostics.

Poxvirus

The Poxvirus Section, led by Dr. Jingxin Cao, develops capacity for the accurate and rapid diagnosis of human poxvirus infection, including both molecular and serological assays for human orthopoxvirus infection (e.g., vaccinia and monkeypox). The Section also conducts research to:

- ✓ use poxvirus as a tool to study interaction between host innate immunity and viral proteins, e.g., influenza NS1 and hepatitis C virus proteins, with the aim to understand virus tropism
- ✓ develop modified vaccinia Ankara-based vaccine for emerging viral infectious diseases such as avian influenza
- ✓ develop a genetically modified vaccinia virus inducing high level of interferon and pro-inflammatory cytokines for safe and effective adjuvants

2014-15 Goals and Activities / Outputs

Goal#1 Contribute to the capacity to respond to bioterrorism attacks involving poxviruses and emerging human poxvirus infections through diagnostic services.

Activities / Outputs

1.1 Develop molecular diagnostic assays (e.g., PCR, genome-wide sequencing) for rapid and accurate identification of human poxvirus infections.

1.2 Develop antibody-based diagnostic assays (e.g., ELISA, immunoblot) to augment molecular diagnostic assays for human poxvirus infections.

1.3 Develop antiviral and vaccines for human poxvirus infections with improved safety.

Goal#2 Contribute to reduce incidences of viral infectious diseases in Canada through development of poxvirus-based recombinant vaccines.

Activities / Outputs

2.1 Conduct research on developing a recombinant modified vaccinia virus inducing high level of interferon and pro-inflammatory cytokines as a safe and effective adjuvant for vaccines.

2.2 Develop poxvirus as a vector for rapid influenza vaccine development and testing.

Goal#3 Contribute the discovery of novel prophylactic and therapeutic methods for viral infectious diseases.

Activities / Outputs

3.1 Utilize poxvirus as a research tool to investigate the basic science of factors that determine virus host range and cell tropism, e.g., the role of avian influenza virus NS1 protein in breaking the species barrier to infect humans.

3.2 Utilize an interferon sensitive vaccinia virus mutant to screen hepatitis C virus proteins for anti-interferon activity and help reveal the mechanism of persistent hepatitis C infection.

3.3 Develop vaccinia virus as a model to study host cell innate immune responses and the interplay between innate immunity and adaptive immunity. Knowledge generated from such investigations will help to design safer and more effective prophylactic and/or therapeutic vaccines.

Bloodborne Pathogens and Hepatitis

The Bloodborne Pathogens and Hepatitis Section, led by Dr. Booth, provides serological and molecular reference services for hepatitis A, B, C, D and E virus infections (HAV, HBV, HCV, HDV and HEV, respectively), as well as consultation on diagnostics issues and develops tests for the detection of other potential Bloodborne pathogens. The Section also conducts research to address questions of hepatitis infections in Canada and throughout the world with a focus on viral hepatitis endemic countries in order to mitigate the risk of importation into Canada through immigration.. Research within the program falls into four broad areas: surveillance, diagnostics, pathogenesis, and clinical management. Each area is part of an overall strategy to contribute to our understanding of these pathogens, and to assist in treatment and prevention protocols.

2014-15 Goals and Activities / Outputs

Goal#1 Monitor the incidence, and contribute to reduced incidences of viral hepatitis and other emerging bloodborne pathogens in Canada through reference and diagnostic services.

Activities / Outputs

1.1 Provide advanced laboratory reference services for hepatitis viruses.

1.2 Develop and improve laboratory assays for viral hepatitis and for identification of emerging pathogens with blood-borne potential.

1.3 Participation in national/international assessment of suitability of hepatitis candidate materials to be used as national/international standards .

1.4 Provide consultation, guidance and updates to clients and stakeholders regarding viral hepatitis reference and diagnostic services.

1.5 Provide laboratory support for surveillance on hepatitis and emerging bloodborne pathogens.
1.6 Provide special request diagnostics for HCV genotyping and drug resistance.
1.7 Provide special request diagnostics for HBV molecular (genotyping, mutant and drug resistance (DR) testing) and serological (quantitative HBsAg) analysis.
1.8 Evaluate commercial diagnostic test kits, report evaluation, and incorporate assays, as applicable, in reference services..
1.9 Carry out a pilot study to include IL28B SNPs as a regular reference service.

Goal#2 Monitor the incidence, and contribute to reduced incidences of hepatitis and other emerging bloodborne pathogens including erythrovirus and human herpesvirus 8 (HHV8) in Canada through surveillance activities.

Activities / Outputs

2.1 Participate in the Canadian Health Measures Survey (CHMS) for HCV and HBV.
2.2 Conduct surveillance of HBV genotypes, mutants and occult hepatitis B in selected demographic and high-risk populations (ie. seroepidemiological and molecular analysis investigation of HBV infant vaccination 20 year followup in Nunuvut) and analyze correlations with demographic, risk and clinical factors as well as antiviral drug resistance.
2.3 Sequence and perform phylogenetic analysis on HBV and HCV genomes for molecular viral epidemiology.
2.4 Initiate quality assurance programs for serological and molecular identification of erythroviruses and HHV-8.
2.5 Provide laboratory support for surveillance and molecular identification and characterization of HAV, HDV, HEV (ie. surveillance of HEV in wild animal/cervid populations of Canada) and other emerging bloodborne pathogens.
2.6 Provide laboratory support for national/international partners/requests involving seroepidemiological and molecular investigations of viral hepatitis in general and blood donor populations.
2.7 Estimate HEV seroprevalence in Canada by using CHMS cycle 1 biobank samples.
2.8 Assessment and validation of different molecular tests for detection of parvoviruses.
2.9 Estimate HEV infection among Canadian HIV/HCV co-infected patients

Goal#3 Monitor the incidence, and contribute to reduced incidences of viral hepatitis in Canada through applied and discovery research.

Activities / Outputs

3.1 Conduct molecular identification and characterization of HAV, HBV, HCV, HDV and HEV strains in the general Canadian population and in specific patient groups (i.e., HIV co-infected patients, residents in Nunavut, NWT, and the wider circumpolar Arctic, acute sporadic viral hepatitis in different regions of Kenya), and HEV in wild animal reservoirs.
3.2 Conduct investigation of hepatic stem/progenitor cells as an HBV/HCV infection model.
3.3 Develop reference tests for new HBV and HCV clinical biomarkers and investigate their utility in HBV patient management (HBsAg quantification, IL28B allele variation).

3.4 Develop EIAs for detection of anti-HEV among wild-life in Canada.
3.5 Utilize transgenic human cell lines expressing various HCV genes to determine their effects on the host cell. Identify and characterize the interactions between viral and host cellular proteins using HCV virus-bait tandem affinity methods to understand the mechanism of virus replication and pathogenesis.
3.6 Undertake high-resolution, quantitative proteomic analysis of HCV-infected cell culture lysates and HCV-infected patient PBMC samples to understand the impact of HCV replication on host cell proteins.
3.7 Identify host cellular factors required for HCV replication using antisense ribozymes and RNA interference genomics to advance potential therapeutic targets.
3.8 Conduct HBV protein functional analysis and viral-host protein-protein interactions.
3.9 Develop phenotypic replicative HBV constructs to investigate emerging hepatitis B drug resistance and immune escape mutants using a phenotypic replicative construct and protein expression.
3.10 Conduct investigative research on HBV genotypes to determine mechanism of infection.
3.11 Characterize new antivirals against influenza virus and vaccinia virus.
3.12 Analyze tumorigenesis pathways activated by HBx and core genes. Identify pathways that are activated by HBx and core genes.
3.13 Search for specific motifs in HBx and the core protein that triggers signal transduction activation.
3.14 Identify the host cellular proteins and signalling pathways through which HCV NS3 and NS3/4A induce cellular transformation.
3.15 Identify repressors of tumorigenesis signal activation.
3.16 Identify mutations associated with resistance to new protease HCV antivirals approved for treatment in 2011.

Goal#4 Contribute to NML's emergency preparedness and outbreak response capabilities.

Activities / Outputs

4.1 Provide laboratory support for field investigations and molecular analysis of hepatitis virus strains associated with viral outbreaks in Canada.
4.2 Introduce Next Generation Sequencing (NGS) platform for outbreak investigation.

Goal#5 Contribute to Canadian and global laboratory network activities through collaboration and leadership.

Activities / Outputs

5.1 Provide national capacity for quality assurance and molecular diagnostic method validation through participation in the National Microbiology Molecular Diagnostic Users Group and the Validation sub-group.
5.2 Demonstrate national / international leadership in matters related to viral hepatitis in the Circumpolar North through participation in the Circumpolar Viral Hepatitis Working Group Meetings and research activities.
5.3 Provide consultation for all of NML on PHAC surveillance and science and research activities in the North as part of the PHAC Northern Public Health Agenda Action Plan.
5.4 Provide PHAC representation for SAON (Arctic Council Sustaining Arctic Observing Networks) national / international activities.

5.5 Conduct international collaborative research on viral hepatitis in Nairobi, Kenya with collaborators at: the University of Manitoba and the Kenya Medical Research Institute; the National and Kapodistrian University of Athens; the University of New Zealand. .

5.6 Participate in the Global HCV Network initiative funded by PHAC.

Diagnostic Microscopy and Imaging

The Diagnostic Microscopy and Imaging Section, led by Dr. Booth, complements and enhances research and diagnostics at NML by operating an electron microscopy facility that allows scientific staff to conduct studies on microbiological organisms with far greater resolution and depth of vision than with conventional light microscopes.

2014-15 Goals, Activities / Outputs

Goal#1 Improve the accessibility of NML laboratories to conduct reference services, diagnostic activities, and research activities.

Activities / Outputs

1.1 Maintain and update scanning and transmission Electron Microscopy equipment as required to ensure accessibility for reference, diagnostic and research activities.

1.2 Providing highly-specialized, microscopy-based diagnostic services, including the identification and characterization of emerging and rare infectious diseases.

1.3 Developing and applying new microscopy-based diagnostic methods and technologies.

Goal#2 Contribute to NML's emergency preparedness and outbreak response capabilities.

Activities / Outputs

2.1 Develop mobile Scanning Electron Microscope (SEM) for use with the existing Dycor aerosol collection systems to detect infectious air-borne particulate materials.

2.2 Begin trials with the recently-acquired mobile CL-3 enclosure for the mobile SEM.

2.3 Begin trials with the energy dispersive spectrometer for the mobile SEM which will permit the chemical identification of samples being diagnosed. It also will be able to discriminate and identify both organic and inorganic samples in a CBRNE first-response activity.

2.4 Begin field testing the mobile SEM laboratory using various Bacillus species as a suspect airborne and cultured BT specimens.

Goal#3 Demonstrate laboratory leadership by promoting and facilitating collaboration within the CSCHAH and with external laboratories.

Activities / Outputs

3.1 Participate in GSHAG laboratory workshops and proficiency panels.

3.2 Develop Standard Operating Procedures for diagnostic and research activities to validate test results.

3.3 Maintain the diagnostic microscopy image database archive to maintain records and archive data for future reference.

Goal#4 **Demonstrate laboratory leadership by promoting and facilitating collaboration within the CSCHAH and with external laboratories.**

Activities / Outputs

4.1 Establish additional diagnostic and research projects to:

- identify the interaction between virus and host using high-resolution electron tomography of SARS and influenza virus on liposome receptor complexes;
- provide three-dimensional characterization of the SARS spike by labelling with neutralizing and non-neutralizing monoclonal Fabs;
- provide high-resolution images and electron tomograms of standard preparation and high-pressure frozen tissue infected with the SARS and influenza virus;
- develop new procedures for "quad axis and spiral-axis cryo tomography" that will greatly enhance the detection / resolution in the investigation of the SARS coronavirus, Ebola, and Marburg virus;
- identify the glycosylated components of the spikes of the SARS-CoV and Ebola virus; and
- develop procedures for the purification and isolation of the spike of the SARS coronavirus.

Enteroviruses and Enteric Viruses

The Enteroviruses and Enteric Viruses Section provides reference diagnostics and surveillance of clinically-relevant human enteroviruses, parechoviruses, and other enteric viruses such as hepatitis A, human caliciviruses and rotaviruses. As the national reference laboratory for polioviruses, the Enterovirus Section is responsible for the identification and typing of all poliovirus isolates found in Canada.

2014-15 Goals, Activities / Outputs

Goal#1 **Contribute to the WHO polio eradication program by functioning as the National reference laboratory for polioviruses / enteroviruses.**

Activities / Outputs

1.1 Continue to perform reference and diagnostic services including the molecular typing and sequencing of polioviruses (and other enteroviruses) as part of Canada's monitoring system for the notifiable diseases, e.g., acute flaccid paralysis and polio.

1.2 Continue working toward accrediting lab investigations for acute flaccid paralysis / poliovirus testing to PAHO and ISO 17025 standards. Develop / validate the cell culture and RT-PCR typing methods for detection and typing of wild-type and vaccine-derived polioviruses.

1.3 Continue building communications with other stakeholders to improve the awareness of the section's capabilities and responsibilities at the local, national and global levels. This will include the above-mentioned polio accreditation activities.

1.4 Continue to serve as the national repository for all wild-type polivirus stocks and to provide stocks of vaccine strains of polioviruses as needed to other labs in Canada to use as reference standards.

1.5 Provide emergency and outbreak response services including providing expert information and coordinating and performing lab activities including cell culture and/or molecular methods for detection, typing and

sequencing of poliovirus or other enteroviruses / enteric viruses as needed.

Goal#2 Establish the Enteroviruses Section as an internationally-recognized laboratory reference centre.

Activities / Outputs

2.1 Accredit the above-mentioned poliovirus testing and general Enterovirus Section tests to the ISO 17025 and PAHO standards and participate in more external proficiency panels where applicable.

2.2 Continue to update laboratory testing and molecular surveillance methods to be able to detect the latest newly-emerging strains.

2.3 Participate in research activities as time allows with other internal or external groups.

2.4 Increase awareness of the section's capabilities and mandates through increased communications with various laboratories and other stakeholders. Continue to conduct surveys of client enterovirus screening capabilities and keep NML website "Guide to Services" up to date.

2.5 Promote the submission of enterovirus positive isolates to the lab for sequencing and molecular typing analysis, thereby increasing the awareness of current circulating enterovirus / enteric virus strains in Canada.

2.6 Help to develop / participate in a national enterovirus surveillance system. Work toward building a national database of enterovirus positive test results and sequencing data and maintain communications with other local and national working groups.

Goal#3 Contribute to improved detection methods and communication systems for the control of Noroviruses.

Activities / Outputs

3.1 Continue to use laboratory surveillance and outbreak investigation results to track differences in rates of Norovirus activity, allow the identification of newly emerging Norovirus strains, and to support the identification of point source outbreaks.

3.2 Continue to participate, as part of the Norovirus working group, in the evaluation of detection and genotyping protocols to ensure new emerging strains are detected.

3.3 Continue developing the Norovirus diagnostics and research program that will include:

- genotyping and maintaining a database of current circulating strains in Canada;
- participate in the international working group to identify and name new emerging NoV strains;
- in collaboration with the Bureau of Microbial Hazards, develop proficiency panels to assess the performance of detection assays used nationally and internationally; and
- continue to develop the electronic norovirus surveillance network to enable rapid exchange of outbreak and sequence data through ViroNet and CNPHI.

Goal#4 **Contribute to the national program to reduce incidence of Rotavirus through routine childhood immunization.**

Activities / Outputs

4.1 Conduct molecular characterization of circulating rotavirus strains in Canada to determine if there are emerging strains that may challenge the effectiveness of vaccines licensed for use in Canada.

4.2 Undertake research to improve diagnostic techniques to type rotavirus strains.

Goal#5 **Contribute to reduced Rotavirus burden of disease seen at pediatric tertiary centres.**

Activities / Outputs

5.1 Continue to improve molecular methods for the detection and typing of Rotaviruses.

5.2 Continue Rotavirus surveillance via the IMPACT RoV study group to determine genotypic shifts associated with vaccine use, as well as to identify vaccine failures due to viral genotype shifts.

VIRAL DISEASES PROGRAM - Budgets and Staffing

Salary Funding

Annualized Salaries:	$3.582M	
Approved FTEs:	44	
Vacant Approved Positions:	3	(as at June 30, 2014)

O&M Funding

Allocated Notional O&M:	$1.303M	(Includes $90K GRDI funding)

National HIV and Retrovirology Laboratories

The National HIV and Retrovirology Laboratories (NHRL) under the direction of Dr. Paul Sandstrom, provides leadership and innovation in a comprehensive range of laboratory services and scientific expertise relating to HIV and emerging retroviruses. The NHRL stakeholders include the provinces and territories, the Agency's Surveillance and Epidemiology Division (SED), the Canadian Association of HIV Clinical Laboratory Specialists (CAHCLS), the World Health Organization (WHO), academic researchers, hospitals, blood-screening laboratories, and many international laboratories. The core activities of the NHRL include:

- ✓ National reference testing for HIV and HTLV in support of provincial and territorial ministries of health.
- ✓ HIV laboratory quality assurance
- ✓ Laboratory support for public health surveillance of HIV transmission and drug resistance
- ✓ Leading national public health laboratory co-ordination for HIB/HTLV
- ✓ Innovative approaches to enhance HIV surveillance, and inform prevention and control strategies
- ✓ Integrated HIV data management
- ✓ Unique, specialized screening and diagnostic testing for HIV/HTLV
- ✓ Support for international policy development and evaluation relating to HIV testing
- ✓ Providing knowledge translation in laboratory methods to Agency/WHO initiatives globally
- ✓ Training and education of health care and public health workers
- ✓ Public health laboratory related leadership and innovation
- ✓ Evaluating threats to human health from zoonotic retroviral infections

The NHRL activities are comprised of a range of highly specialized scientific and laboratory expertise that serve to support surveillance of nationally reportable diseases; build public health capacity through the knowledge translation of innovative testing methodology; support P/T public health laboratories in HIV/HTLV diagnosis; and demonstrate laboratory leadership within horizontal international partnerships. These activities represent a significant contribution to NML core functions and support the Agency's mandate with regards to the prevention and control of infectious diseases. Although the move of the NHRL from Ottawa to Winnipeg has presented a number challenges over the past 3 years, it has also provided new opportunities for redeveloping and strengthening the laboratory's programs. NHRL's relocation to the JC Wilt Infectious Disease Research Centre, a state of the art facility in close proximity to the CSCHAH, will allow it to benefit from the scientific core and administrative services provide by the NML.

For fiscal year 2014-15, the NHRL will focus on 6 primary goals

1. Support prevention, control and monitoring efforts in public health by providing laboratory diagnostics and reference services for HIV and HTLV.

2. Perform national, reference level HIV testing to support surveillance of emerging viral trends and to provide data to support Agency prevention programs

3. Improving evidence-based public health practices regarding the prevention and control of HIV infections, through mandate driven applied and translational research.

4. Provide dynamic laboratory response to investigate the changing epidemiology of HIV and/or HTLV infections.

5. Contribute to Canadian and global laboratory leadership in HIV network activities through input into Policy Development and Best-Practices

6. Contribute to improvements in detection, surveillance and public health risk of novel retroviral infections from human and animal interactions that may affect the safety of Canada's blood supply.

The NHRL's specialized laboratory expertise is organized within four working divisions that collaborate with internal and external stakeholders to guide national and international public health policies.

National Laboratory for HIV Reference Services

The National Laboratory for HIV Reference Services (NLHRS), led by Dr. John Kim, is strongly tied to improving and supporting Canadian public health laboratory activities which include:

- ✓ Provision of highly-specialized diagnostic services for provincial / national / international partners.
- ✓ Quality assurance and external quality control monitoring programs for HIV and HTLV (Human T-Lymphotropic Virus) serology, and HIV viral load testing.
- ✓ Expertise in medical lab quality management. The NLHRS is the first Canadian lab to be accredited to the ISO 15189 standard (Medical Laboratories - Particular Requirements for Quality and Competence).
- ✓ Rapid surge and occupational exposure testing.
- ✓ The NLHRS strives to understand and develop possible solutions for infectious diseases through applied research and application to public health. The laboratory is committed to leadership in providing reliable expertise and assistance to all external and internal stakeholders through knowledge translation.

2014-15 Activities / Outputs

Goal#1 **Support the prevention, control and monitoring efforts in public health by providing laboratory diagnostics and reference services for HIV and HTLV.**

Activities/ Outputs

1.1 Providing and improve state-of-art testing methodologies for HIV and HTLV by re-validating all HIV and HTLV PCT testing algorithms used in current testing and transfer tests to a "real-time" and digital-PCR amplification platforms. These efforts improve sensitivity, specificity and turn-around-time for problematic samples submitted by Canadian public health, hospital and other medical stakeholders.

1.2 Characterize problematic samples diagnosed as HTLV-1 HTLV-II and improve detection of rare HTLV/PTLV strains. In addition to being the linkage to care and treatment, the knowledge generated in this activity improves on current serological and molecular test many which are not available to public health labs.

1.3 Increase the capacity to detect HIV infection in Canada by evaluating new HIV viral load testing platforms for the quantification of HIV viral load to monitor the performance of assays responsible for detecting the

growing number of non-B subtype infections in Canada. This complements the HIV Viral Load Proficiency Testing program and allows the NLHRS to stay current in new technology development. This activity also ensures these assays are reliably able to quantitate at low viral set points (currently 1—cp/ml) which is associated with breakthrough of drug resistant HIV.

1.4 Improve the understanding and clinical monitoring of novel and rare HIV and HTLV genetic variants by developing and providing the only HIV-2 and HTLV-I viral load assays in Canada using a 'real-time' platform. This capacity is not available elsewhere in Canada. Improvements to both assays for this year will be to transfer them to a digital PCR platform to enhance sensitivity and eliminate the need for standard curves. Monitoring of trends in reference service activities indicates a growing number of HIV-2 infected patients in Canada and requests for HIV-2 viral load testing. Likewise an increasing number of requests for HTLV-I viral load monitoring related to clinical signs associated with HAM/TSP also appear to be increasing.

1.5 Conduct enhanced characterization of HIV-1 non B subtypes in problematic reference samples. These difficult-to-diagnose samples, the majority of which turn out to be HIV positive non-B subtype and/or elite controllers allows us to inform on their impact on diagnostic and clinical monitoring tests used in Canada but may also provide information on the biology of these unique samples and potential targets for drug intervention.

Goal#2 Perform national, reference level HIV testing to support surveillance of emerging viral trends and to provide data to support Agency prevention programs.

Activities/ Outputs

2.1 Perform laboratory testing for viral STIs in PHAC-epi-surveillance surveys including specialized testing for early infection using dried blood spots (DBS). The use of DBS makes Canada unique in its method of sample collection for the purposes of epidemiology-surveillance activities.

2.2 Perform and improve testing methods using DBS by development of specialized bead-based technologies to reduce the amount of sample required from DBS. This improvement in efficiency will increase the scope of infectious agents that can be potentially be detected within a single sample including HIV, Hepatitis C and syphilis.

2.3 Enhancing national surveillance activities from clinical laboratories by ensuring and advocating for high-quality testing and accuracy through monitoring by national proficiency testing programs for HIV antibody, HIV CD4 and HIV viral load. These programs ensure that HIV algorithms are the strongest in Canadian public health labs and are capable of detecting and quantitating all HIV which leads to reduced transmission of HIV.

2.4 Training front-line-workers on collection and transportation of samples collected on DBS. The transfer of this knowledge improves the uptake of using DBS and improves epidemiology-surveillance efforts.

Goal#3 **Improving evidence-based public health practices regarding the prevention and control of HIV infections, through mandate driven applied and translational research.**

Activities/ Outputs

3.1 Understanding HIV infection in newborns and young infants. In collaboration with Canadian paediatric clinicians and a recently funded CIHR-CANFAR core research grant to examine treatment and 'cure' phenotype similar to the recently publicized 'Mississippi' baby.

3.2 Evaluate a new rapid test for HIV and syphilis and HIV viral load technologies that can be used to improve diagnosis and clinical monitoring in point-of-care settings. The potential implementation of these devices would also improve efficiency of testing in epi-surveillance activities.

3.3 Develop and provide novel quality control standards and reagents for public health, clinical and hospital labs performing diagnostic and quantitative molecular methods to aid external quality control, genotyping and in-house method developments and ultimately improve.

3.4 Organize one CIHR Café Scientifique to better inform colleagues and the general public to the benefits of applied public health research conducted within the NLHRS/NHRL.

Goal#4 **Provide dynamic laboratory response to investigate the changing epidemiology of HIV and/or HTLV infections.**

Activities / Outputs

4.1 Conduct rapid response testing to dynamic and unexpected HIV and/or HTLV surges in Canada through specialized and rapid turn-around-time (TAT) testing for occupational, deliberate and other adverse public health events.

Goal#5 **Contribute to Canadian and global laboratory leadership in HIV network activities through input into Policy Development and Best-Practices.**

Activities / Outputs

5.1 Continue to demonstrate leadership with the CAHCLS (Canadian Association for HIV Clinical Lab Specialists) organization to promote quality and discussion on all aspects related to HIV testing.

- Improve, contribute and engage in development of national policies and best practice guidelines to better inform laboratorians, clinicians and end-users. (eg PHAC HIV Testing guidelines, Point-of-Care HIV Testing)
- Inform, promote and improve on quality management practices in Canadian public health and medical testing laboratories. This is achieved by participation in Standard Council Canada's ISO 15189 working group

5.2 Collaborate and provide expertise with the NML quality office in its efforts to incorporate ISO 15189 in its laboratories providing reference testing. This provides confidence to Canadian public health laboratories that NML reference activities and services ascribe to one of the highest levels of quality management in its programs

5.3 Continue to participate in two national working groups (CIHR-PHAC and OHTN) on point-of-care testing

5.4 Continue to inform and educate public health and laboratory laboratories on new CLSI M53 guidelines recommending elimination of the HIV western blot and implementation of new tests for HIV-2 and NAT will

have major impact on HIV testing algorithms, turn-around-time, epidemiology and incidence and linkage to care and treatment.

5.5 Development of a new inexpensive, flexible, data entry system for proficiency testing for Canadian public health laboratories with potential application to resource-limited settings

5.6 Promote and improve on North American Quality management guidelines by participating in Clinical Laboratory Standards Institute (CLSI) working groups on general quality management practices

National Laboratory for HIV Immunology

The National Laboratory for HIV Immunology (NLHI), led by Dr. Blake Ball, is the national resource for HIV Immunology and contributes to the global effort against the HIV/AIDS pandemic by providing reference services for markers of HIV disease, laboratory leadership on protocols and best practices in immune monitoring, and conducting fundamental and applied research to better understand HIV transmission and pathogeneses. These activities are conducted by:

- ✓ providing reference services through a national proficiency program to monitor markers of disease progression by developing standard techniques and guidelines for immunological monitoring of HIV/AIDS patients
- ✓ providing international leadership in assisting resource poor regions hardest hit by the HIV pandemic with quality performance assessment of CD4 T-cell enumeration
- ✓ providing leadership and support to the HIV research community by disseminating innovative, cutting-edge technical information and evaluating, assessing, adapting and developing new technologies that may be suitable for monitoring HIV/AIDS disease progression
- ✓ conducting applied and discovery-based research to better understand immune control of HIV infection and inform HIV vaccine and therapeutic development, and conducting studies to better understand the immunobiology of HIV/TB coinfections, a growing public health concern

2014-15 Activities / Outputs

Goal#1 **Support prevention, control and monitoring efforts in public health by providing laboratory diagnostics and reference services for HIV and HTLV.**

Activities/ Outputs

1.1 In collaboration with the National Reference Center for Mycobacteriology (NML) improve the current gold standard in laboratory diagnostics for Tuberculosis in HIV co-infected subjects by using modern immunologic techniques. Better diagnostic tools for HV/TB co-infected subjects will limit HIV disease progression and TB reactivation and improve the health of infected subjects, especially in at-risk populations such as recent immigrants and Aboriginal/First Nations populations.

Goal#2 **Perform national, reference level HIV testing to support surveillance of emerging viral trends and to provide data to support Agency prevention programs.**

Activities/ Outputs

2.1 In collaboration with researchers at the Global School for Public Health (U of Manitoba) evaluate the role of Point of Care (POC) diagnostics in improving surveillance for CD4 T cell enumeration/viral load (VL) and early infant diagnosis (EID) to strengthen the care and treatment

cascade of HIV infected individuals living in rural and remote locations. This will determine the efficacy of POC diagnostics to enhance public health surveillance and to better diagnose and treat HIV infected individuals without access to extensive laboratory infrastructure.

Goal#3 Improving evidence-based public health practices regarding the prevention and control of HIV infections, through mandate driven applied and translational research.

Activities/ Outputs

3.1 Evaluate the role of host factors in preventing or facilitating transmission of HIV through breast milk using multiple immunologic approaches. The identification of factors facilitating breast-milk transmission will inform best practices in breast feeding and ultimately reduce mother to child transmission of HIV, identified by the WHO and CIDA as an important millennial milestone for HIV prevention.

3.2 Determine if altering the expression of host genes thru direct and epigenetic regulators can effectively drive HIV replication from latent reservoirs, and in conjunction with anti-retroviral treatment, effect a clinical 'cure' for HIV. This would effectively reduce and limit the development of anti-retroviral drug resistance in patients being treated for HIV/AIDS.

3.3 Conduct studies using proteomics, immunomics and epigenetics to determine the mechanisms behind HIV pathogenesis and transmission at the male and female genital tract to evaluate HIV vaccine and microbicide safety and efficacy. The identification and characterization of how host factor(s) regulate susceptibility to infection will allow the development of novel public health prevention strategies against HIV/AIDS and better understand and predict microbicide and vaccine efficacy.

Goal#4 Contribute to Canadian and global laboratory leadership in HIV network activities through input into Policy Development and Best-Practices.

Activities / Outputs

4.1 As mandated under the Federal Initiative to Address HIV/AIDS in Canada, improve the quality of care, treatment and support for those living with HIV in Canada to nation-wide clinical laboratories by providing external quality control assurance, evaluation and remedial action as appropriate. This insures the quality of clinical care of HIV infected subjects throughout Canada and reduces the rate of new HIV infections,

4.2 As part of the Global engagement strategy of the Federal Initiative to Address HIV/AIDS, in collaboration with the Clinton Health Access Initiative, the African Society of Laboratory Medicine and private-public partnerships evaluate the quality, reproducibility and implementation of quality assurance programs for CD4 enumeration, and for POC HIV diagnostics (CD4/VL/Early Infant Diagnosis) in resource poor settings. These findings are directly applicable to the implementation of POC systems in rural and resource-limited settings, such as Northern communities across Canada.

4.3 In collaboration with the HIV Vaccine Trials Network and the Microbicide Trials Network (USA), the NLHI helps lead studies to determine the safety, tolerability and efficacy of current HIV vaccine and microbicide candidates at mucosal surfaces. The NLHI is the main Canadian contributor to two of the Worlds largest HIV biomedical prevention organizations efforts to evaluate novel public health intervention strategy.

National Laboratory for HIV Genetics

The National Laboratory for HIV Genetics (NLHG), led by Dr. James Brooks, performs specialized genetic analysis of HIV to support the following activities:

- ✓ HIV Drug Resistance Surveillance - Specimens from domestic and international stakeholders are forwarded to the NLHG for specialized HIV drug resistance testing. Results from analysis are used to support public health surveillance of HIV drug resistance.
- ✓ Innovative Approaches to Advance Public Health Laboratory Science - The NLHG develops new methodology to enhance the resolution of standard epidemiology in tracking HIV transmission; explores new molecular and serological methods for determining the recency of infection; and endeavours to establish novel state-of-the-art HIV DR testing systems.
- ✓ Knowledge Translation in HIV Drug Resistance Testing - In collaboration with the WHO, the NLHG provides in-house training to international scientists and members of international laboratories.
- ✓ Develop Standardized, Low-cost HIV Specimen Collection and Analytic Methods for HIV DR Monitoring in Remote Locations. Through its partnership with the WHO, the NLHG is engaged in the advancement of specimen collection methods in the form of dried blood spots (DBS) and advanced liquid stabilization media.
- ✓ Ongoing Zoonotic Retroviral Surveillance. As new zoonotic retroviral infections are identified, the NLHG performs laboratory based risk-assessment to support evidence-based decision making in the Agency's response to these agents*.*

2014-15 Activities / Outputs

Goal#1 **Perform national, reference level HIV testing to support surveillance of emerging viral trends and to provide data to support Agency prevention programs.**

Activities/ Outputs

1.1 The National Laboratory for HIV Genetic provides laboratory support for the, Agency's Canadian HIV Strain and Drug Resistance Surveillance Program. Under agreements with participating provinces, a portion of the specimen used to diagnose someone with HIV infection is sent to the NLHG for genetic testing. Specimens are analyzed for the presence of HIV drug resistance and the viral strain (subtype) is identified. These data are then reported to the Agency's Surveillance and Epidemiology Division. In collaboration, the laboratory and the surveillance create a report on the trends in HIV drug resistance (DR) and describe changing patterns in the circulating HIV strains. In addition to internal reporting, results are distributed to the provincial stakeholders if requested in the memoranda of understanding.

- This program contributes to public health surveillance by providing information to stakeholders by providing information to policy makers on the predicted effectiveness of HIV medications to both prevent and treat HIV infections.
- Through analyzing the trends in HIV DR, the Agency and provincial stakeholders can evaluate the efficacy of the treatment engagement and care treatment cascade.

- Combining HIV genetic and epidemiological data identified trends to inform the development of intervention and control strategies.
- Finally, laboratory surveillance of the different HIV strains will inform HIV vaccine policy and development and ensure that candidate vaccines are effective in preventing Infection due to the circulating strains found in Canada

1.2 Perform innovative, specialized laboratory analysis on HIV specimens to determine which specimens come from people who are more recently infected. By understanding which infections are new, one can infer where more HIV transmissions are occurring and hence determine the direction of the epidemic. These data facilitate evidence based decision making in the public health response to changing trends in the HIV epidemic at both the provincial and the national level.

1.3 To improve field surveillance for HIV DR, the NHRL in partnership with the WHO and Canadian companies is developing methods for collecting, stabilizing and storing HIV diagnostic specimens. The current paradigm for specimen collection involves a drawing blood, processing the blood in a specialized facility, and storing the plasma at -80ºC until tested. The NLHG is improving the alternative methods of specimen collection, such as dried blood spots, and testing newer liquid preservative media for their effectiveness in drug resistance testing. Field friendly technologies will strengthen public health capacity and improve accessibility for HIV testing for people in remote communities throughout Canada including First Nations.

Goal#2 Improving evidence-based public health practices regarding the prevention and control of HIV infections, through mandate driven applied and translational research.

Activities/ Outputs

2.1 To understand and prevent transmission of HIV among high-risk groups by using molecular epidemiology and modelling transmission patterns of the virus from those who have recently acquired the infection. The genetic sequence of HIV contains information that allows the laboratory to conduct a “family-tree” analysis of viruses to see if they are related to one another. Using these techniques, and measures of recency of infection, we can determine if there are clusters of related infections that are correlated with risk behaviour or geography. This innovative approach provides a further layer of resolution to traditional public health surveillance. Furthermore, this same analysis can be used to evaluate prevention initiatives by determining the distribution of ongoing infections with respect to their relatedness to the viruses present at the time of the implementation of the initiatives.

2.2 Engage world experts in collaboration on state-of-the-art HIV sequence analysis to better understand HIV transmission in Canada. Through complex bioinformatics analysis create an anonymized map of HIV transmissions to improve surveillance to inform HIV prevention initiatives.

2.3 Improve representativeness of HIV DR data across Canada. Current HIV DR surveillance results are only available for specimens submitted to the NLHG by the provinces. Due to the complexities of MOA negotiations, and logistic challenges, the current national HIV DR surveillance data is uneven in its geographical representativeness. We have demonstrated that results from clinical specimens are nearly identical to those from first time positive diagnostic sera. In collaboration with SED we are engaging

provinces to provide data from clinical specimens to confirm our findings and move toward a move cost-effective and more representative HIV DR surveillance methodology.

2.4 Conduct laboratory testing and analysis for the emergence of resistance to newly developed HIV medications. As pharmaceutical companies develop antiretrovirals that have novel viral targets, the NLHG monitors and will develop new assays that will identify the new DR mutations and the emergence of resistance will be reported to provincial stakeholders. The results will integrated into existing HIV DR surveillance data to provide a more complete picture of DR to health professionals at all levels of government.

2.5 Develop independent HIV drug resistance testing programs in resource limited settings through collaborative technology transfer, including creating in-country collaborative research projects and by providing training to individuals in the NLHG. The goal for these projects is to strengthen laboratory support for public health surveillance activities in settings where laboratory training programs need support.

2.6 Improve HIV genotyping capacity domestically and in resource-poor countries by developing novel, low-cost and accessible HIV genotyping platforms.

- The NHRL has successfully developed a next-generation sequencing (NGS)–based HIV DR testing platform which offers significantly improved sensitivity, data throughout and a >50% cost reduction in comparison to conventional testing approaches. This platform has been demonstrated to be suitable for HIV DR surveillance tests in which large numbers of specimens need to be screened. As a knowledge translation effort, this collaborative project with PAHO is designed to introduce and implement NGS-based HIV DR testing technology into routine HIV DR surveillance in Latin America and the Caribbean.
- In collaboration with the Bioinformatics core facility we have developed software that identifies all the HIV DR mutations in specimens sequenced using NGS. Access to this software in resource limited settings will allow countries to develop standardized, quality controlled HIV DR surveillance reports that can be used to evaluate domestic, national HIV treatment programs and to guide policy development.
- Improve the ability to analyze and share drug resistance data with stakeholders through the development of an advanced single platform HIV viral load/genotyping database. In resource limited settings, the current approach to identifying those people on failing ART therapy is to measure the viral load (VL) and then to perform a drug resistance test if the virus is detected. The WHO is very interested in exploring days of steam-lining and improving this diagnostic paradigm, We aim to develop and validate an integrated platform for HIV VL measurement and HIV drug resistance detection that will allow identification and assessment of those HIV infected individuals who are failing HIV treatment with only one test, at a fraction of the cost. Having access to this resource will facilitate evidence based response to disease management.

2.7 Understand and prevent transmission of HIV using improved molecular epidemiology at a national level. Provinces perform HIV surveillance within their province but not beyond their borders. In its national role

within the Agency, the NHRL is in the unique position of being able to analyze HIV DR surveillance data on a national level and to examine HIV transmission across provincial borders and among other discontiguous communities such as First Nations. This national level enhanced HIV DR surveillance can be used to evaluate HIV treatment initiatives.

2.8 Improve understanding of HIV dual or multiple infections (superinfection) by conducting specialized sequence analysis using NGS technology. Through sequencing all the individual viruses in a specimen and having the sequences interpreted independently, multiple infections can be identified. Determining the rate and pattern of multiple infections is very important to our understanding to the mechanisms of HIV vaccine protection which informs vaccine development and post-vaccination monitoring.

Goal#3 Contribute to Canadian and global laboratory leadership in HIV network activities through input into Policy Development and Best-Practices.

Activities / Outputs

3.1 The NLHG improves the care delivery to persons infected with HIV/AIDS globally through participation in the WHO HIV Resistance Network (ResNet). As HIV treatment increase globally, there has been a predictable increase in HIV drug resistance (DR). As the majority of HIV infections exist in resource limited settings, the laboratory infrastructure to support HIV diagnosis and monitoring is similarly lacking. The laboratory demonstrates leadership through developing field friendly, cost-effective HIV DR testing and training staff from participating countries in order to improve HIV DR surveillance in resource limited settings. The NLHG also participates in international steering committees developing WHO HIV DR guidelines which are used as the basis for country-specific policy and prevention initiatives which will ultimately contribute to improved global HIV drug resistance surveillance.

3.2 Identify key elements for improving prevention strategies targeted to the most vulnerable populations. This will be accomplished by evaluating phylogenetic relationships between HIV infections among and between different risk groups and social networks. The combined efforts of NHRL, the Surveillance and Epidemiology Division (SED), provincial and municipal stakeholders, and academic stakeholders will lead to a better understanding of the transmission dynamics of HIV and hepatitis C virus (HCV) among Canadian populations. Specific activities include:

- Collaborating with the HIV/AIDS Surveillance Project (HASP) and the Surveillance and Epidemiology Division (SED), the NLHG is evaluating transmissions during an HIV outbreak among injection drug users in Pakistan. Comparative phylogenetic analysis of HIV will be used to determine the genetic characteristics of circulating HIV strains and to identify phylogenetic relationships between infections within this injection drug user population. An assessment of transmission patterns of HIV among individuals at higher risk for HIV infection will be undertaken in order to guide prevention strategies. Participation in International HIV outbreaks such as in Pakistan, will allow the NLHG to develop and evaluate bioinformatics tools of direct relevance to Canada.
- Evaluate transmission patterns of HIV and HCV in the context of social networks of injection drug users (IDU)to better understand the impact of social networks on the transmission of blood-borne pathogens;

- Evaluate social and phylogenetic relationships within and between recruitment networks, the findings of which will serve to identify key targets for improved prevention strategies.

Goal#4 ***Contribute to improvements in detection, surveillance and public health risk of novel retroviral infections from human and animal interactions that may affect the safety of Canada's blood supply.***

Activities / Outputs

4.1 Retroviral infections are characterized by a latent period between infection and clinical manifestations of disease. From public health perspective, this means that there may be massive transmission of the infection prior to the disease or the mechanism of transmission being identified. HIV presents a text book example of how a blood borne pathogen can be widely transmitted prior to people being aware of its existence. Additionally, as HIV originated from non-human primates, it is also serves as an example of a zoonotic pathogen that has caused tens of millions of deaths once adapted to humans. The NLHG responds to newly identified potential zoonotic retroviral threats to public health through the development of assays to identify these pathogens to support surveillance and risk analysis in addition to guiding blood donor deferral policy.

NATIONAL HIV AND RETROVIROLOGY LABORATORIES - Budgets and Staffing

Salary Funding

Annualized Salaries:	$2.531M	
Approved FTEs:	30 (	Post relocation to Winnipeg)

O&M Funding

Allocated Notional O&M:	$1.440M	(includes Federal Initiative on HIV, and $60K in Biotech/GRDI funding)

HIV and Human Genetics Laboratory

The HIV and Human Genetics Laboratory, under the direction of Dr. Paul Sandstrom and managed by Dr. Ma Luo, conducts a comprehensive range of research activities and has collaborations with many researchers in the National Microbiology Laboratory, Health Canada, University of Manitoba, University of Nairobi, University of Singapore, Karolinska Institute in Sweden, the University of California in San Francisco, Harvard University, University of Santiago de Compostela, Spain, University of Nebraska, University of Wisconsin and University of British Columbia. The major focus of the lab involves:

- ✓ HIV viral genetics including viral diversity, evolution and viral-host interactions
- ✓ Human genetics including host genetic factors in resistance and susceptibility to infectious diseases such as HIV-1, H1N1, TB, etc.
- ✓ Interplay between pathogens such as HIV-1, TB and host genetic factors such as HLA (human leukocyte antigen) and KIR (Killer cell receptor genes)
- ✓ Immunogenetics of host immune response to HIV-1
- ✓ Development of HIV vaccines and control strategies
- ✓ Training and education of students

- ✓ Public health-related research and development

2014-15 Goals, Activities / Outputs

Goal#1 Provide scientific evidence and support through scientific research to guide HIV vaccine development and personalized anti-retroviral treatment.

Activities / Outputs

1.1 Conduct full HIV genome pyrosequencing and analysis to study HIV diversity, evolution and fitness before and after introduction of anti-retroviral treatment to-guide, HIV vaccine development and develop personalized anti-retroviral treatment regimens. Through comprehensive analysis of HIV mutation, evolution and fitness before and after ARV treatment at the whole genome level, we can generate a detailed atlas of PS mutations with defined replication fitness (including compensatory mutations) under host immune pressure and ARV. This comprehensive atlas could then be used to guide personalized ARV therapy choices and inform the development and evaluation of effective therapeutic and prophylactic HIV vaccines. We will collaborate with University of Manitoba/Nairobi (Dr. Joshua Kimani), University of British Columbia (Drs. Melanie Murray, Richard Harrigan and Helen Cole), Harvard University (Dr. James Whitney) and NML researchers, Dr. T. Blake Ball, Dr. Gary Van Domselaar and Dr. Binhua Liang.

1.2 Investigate and characterize the host genetic basis of resistance and susceptibility to HIV-1 infection and disease progression and influencing mother-child HIV-1 transmission. Correlate the host genotypes and haplotypes with resistance or susceptibility to HIV-1 infection and disease progression, as well as mother-child HIV-1 transmission and report research. We will collaborate with University of Manitoba/Nairobi (Dr. Joshua Kimani, Dr. Joanne Embree), Karolinska Institute of Sweden (Dr. Kristina Broliden) and University of Nebraska-Lincoln (Dr. Qingsheng Li). We expect to identify novel targets and develop novel therapeutics for HIV-1 preveation.

1.3 Identify HIV vaccine targets by

- conduct bioinformatical and statistical analyses of host-virus interactions
- characterize epitopes of HLA alleles associated with different outcomes of HIV infection and disease progression using in vitro advanced, high-throughput systems (iTopia epitope discovery, Proimmune REVEAL) to screen HIV-1 proteome;
- conduct ELISPOT, FACS and RNA-Seq analysis to validate and characterize epitopes identified
- study gene expression profiles and immunological responses induced by epitopes of HLA alleles associated with different outcomes of HIV-1 infection;

Goal#2 Conduct genomic, protein, microarray gene expression and bioinformational analyses of HIV-1 resistant and susceptible individuals to identify novel targets for prevention and treatment

Activities / Outputs

We collaborate with University of Manitoba/Nairobi (Dr. Joshua Kimani), and NML researchers, Dr. T. Blake Ball, Dr. Gary Van Domselaar and Dr. Binhua Liang for the following activities. We expect to identify novel targets for HIV prevention and treatment.

2.1 Conduct genome-wide genetic variability (SNPs and whole genome) analysis to identify host factors in resistance and susceptibility to HIV-1 infection.

2.2 Conduct gene copy number analysis to identify correlation with resistance and susceptibility to HIV-1 infection.

2.3 Conduct gene expression (RNA-Seq) analysis to identify differentially expressed / spliced genes in response to HIV-1 infection.

2.4 Conduct RNA-Seq analysis to identify novel micro-RNA for HIV-1 prevention and treatment.

2.5 Conduct gene enrichment and pathway analysis:
- to identify genetic network(s) enriched with the differentially expressed/alternatively spliced genes or genes containing or close to the genetic differences (polymorphisms) significantly associated with different outcomes of HIV-1 infection; and
- to generate testable hypothesis for evaluation by RNAi technology and by quantitative PCR using PCR array analysis.

2.6 Conduct RNA-Seq analysis and gene knock in and knock out analysis to study the mechanism of newly identified genes in resistance or susceptibility to HIV-1 infection.

2.7 Develop methods, techniques and bioinformatic tools to facilitate vaccine research and development including establishing two colour ELISPOT assay methods for interferon gamma and IL-2.

Goal#3 Develop and evaluate novel candidate vaccine and prevention ideas for HIV-1 in a macaque model.

Activities / Outputs

3.1 Collaborate with researchers from NML (Drs. Kobinger, Sandstrom and Ball), University of Santiago de Compostela (Dr. Maria Alonso), University of Manitoba and, University of Nairobi (Dr. Joshua Kimani), University of Wisconsin (Dr. Nancy Schultz-Darken), Harvard University (Dr. James Whitney) and University of Nebraska (Dr. Qingsheng Li) to develop and evaluate a novel HIV vaccine approach that direct host immune responses to focus on the protease cleavage sites of HIV-1. The vaccine aims to force HIV to mutate at the sequences surrounding the 12 protease cleavage sites, and abolish the normal function of the HIV protease, therefore make the HIV virus non-infectious. This includes:
- analyze the data generated in the pilot vaccine project;
- apply additional funding from Gates Foundation/CIHR/NIH to validate the results of the pilot vaccine project;
- optimize the approach of generating immune responses to the protease cleavage sites using mice and low dose vaginal challenge conditions in monkey models.
- conduct a pre-study to optimize experimental conditions to determine the therapeutic effect of a vaccine targeting protease cleavage sites using a nonhuman primate model.
- report the results of the pilot vaccine study.

3.2 Genotype and characterize the major histocompatibility complex (MHC) of non-human primates, such as Cynomolgus macaques to facilitate vaccine and microbicides research using the Cynomolgus macaque as an animal model.

3.3 Report the results of study on MHC of non-human primates.

Goal#4 **Contribute to the development of vaccines and control strategies for H1N1 and other epidemic outbreaks through collaborative scientific research and technology development.**

Activities / Outputs

4.1 Report the results of the correlation of host HLA class I and class II genes and severe cases of H1N1.

4.2 Analysis of host genes sequenced by pyrosequencing and genotype genes involved in inflammatory responses to infectious pathogens and severe cases of H1N1.

4.3 Report the effect of genes involved in inflammatory responses to severe cases of H1N1.

Goal#5 **Contribute to the global understanding of the interaction between HIV-1 infection, tuberculosis, and other infectious diseases through collaborative scientific research and technology development.**

Activities / Outputs

5.1 Collaborate with the National Reference Center for Mycobacteriology (Dr. Meenu Sharma) and University of Nairobi (Dr. Omu Anzala) to study the genetic basis of pulmonary and latent TB infection. We will continue to seek funds from CIHR and other funding agencies for this study.

5.2 Collaborate with University of Singapore for the HLA Typing of the Singapore Genome Variation project and report the results. For this collaboration University of Singapore is providing required reagents and supplies, a technician (0.5) and a co-op student from our lab is working on the project.

5.3 Collaborate with University of Wisconsin, University of Santiago de Compostela, Harvard University and University of Nebraska for HIV vaccine research with SIVmac239/251 and Cynomolgus macaques/Rhesus macaques as model. We are applying for funds from CIHR, NIH and Gates Foundation to conduct this study. Several technicians are involved (1 FTE, 100% time, and 4 technicians spend between 15 to 50% time to conduct studies in different aspect of the vaccine project) in the vaccine study. In 2013 we have obtained a bridge funding of $100,000 from CIHR CHVI so we can use it to conduct a pre-study to optimize experimental conditions. We are applying from $2.6M from NIH and Gates foundation for a large comparative study.

5.4 Collaborate with University of Nebraska (Dr. Qingsheng Li) and Karolinska Institute (Dr. Kristina Broliden) and University of Nairobi (Dr. Joshua Kimani) to study the mechanism of the identified novel host genes in resistance and susceptibility to HIV-1 infection. We have obtained a 3-year CIHR funding of $342,474 from April 1, 2014 to March 31st, 2017 for this study.

5.5 Collaborate with University of Manitoba/Nairobi (Dr. Joshua Kimani), University of British Columbia (Drs. Melanie Murray, Richard Harrigan, and Helen Cole), Harvard University (Dr. .James Whitney) and NML researchers, Dr. T. Blake Ball, Dr. Gary Van Domselaar and Dr. Binhua Liang to conduct “Full genome analysis of HIV mutations/ evolution/ fitness under selective pressures of both host immune system and anti-retroviral treatment”. Through comprehensive analysis of HIV mutation, evolution and fitness before and after ARV treatment at the whole genome level, we can generate a detailed atlas of PS mutations with defined replication fitness (including compensatory mutations) under host immune pressure and ARV. This comprehensive atlas could then be used to guide personalized ARV therapy choices and inform the

development and evaluation of the effective therapeutic and prophylactic HIV vaccines. We have applied for funding from GRDI and CIHR for this study.

HIV AND HUMAN GENETICS LABORATORY - Budgets and Staffing

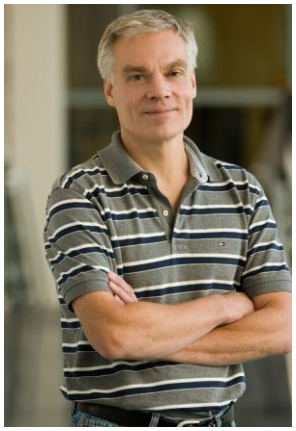
Salary Funding

Annualized Salaries:	$585K	
Approved FTEs:	8	
Vacant Approved Positions:	0	(as at June 30, 2014)

O&M Funding

Allocated Notional O&M:	$200K

Science Technology Cores and Services



The Science Technology Cores and Services (STCS) Division is led by Dr. Grant McClarty. The main role of the Division is to support the NML in national leadership for translating global scientific progress into better public health security and response. In this role, the Divisions main objectives are to:

- ✓ Provide advanced molecular-based technologies leadership, networking, and capacity development for the NML and its partners for better public health security; and offer efficient use of such high-value resources and highly specialized expertise through sharing and centralization.
- ✓ Provide surveillance, reference and diagnostic services, and targeted innovation, as well as quality technical services and support to enable rapid public health response.
- ✓ Provide lab services and strategic oversight for the innovation and development of advanced technologies for new and better options for detection, prevention, and treatment of disease caused by pathogens or biological agents.
- ✓ Provide collaborative support to our NML and broader public health partners for applied public health research aimed at resolving outstanding public health questions – often complex and not addressed by others.
- ✓ Ensure that NML upholds the scientific rigor and integrity of biomedical research with laboratory animals by strictly adhering to the laws, regulations, and policies set out by the Canadian Council of Animal Care.
- ✓ Ensure that the NML employs state-of-the-art waste handling practises to minimize the impact on our environment. .
- ✓ Provide collaborative support to our NML partners, multiple program divisions within PHAC and broader public health partners for innovative public health research; this research may be in support of outbreak prevention and control or advancing the scientific understanding of infectious diseases.

To accomplish our objectives, the Division leverages state-of-the-art equipment, advanced investigative methods, and highly technical / multidisciplinary that leverage technology. These data science efforts are in the areas of:

- ✓ Genomics (DNA sequencing / genotyping / molecular-based analyses)
- ✓ Proteomics and Mass Spectrometry (protein identification and proteome characterization)
- ✓ Bioinformatics (computer analysis of DNA and protein sequence information)
- ✓ Molecular Pathobiology (diagnostic pathology in tissues and animal models)
- ✓ Applied Biosafety Research (containment and decontamination methodologies)
- ✓ Bioforensics Assay Development and Diagnostics (BADD) (biological security response)

STCS also delivers impact with additional centralized services and niche programs that contribute speed, breadth, and overall cost efficiency to NML outputs supporting Branch priorities of public health security or enhancing public health response:

- ✓ Media, Wash-up, and Specimen Receiving
- ✓ Monoclonal Antibodies (immunological reagents and antigens)
- ✓ Veterinary Technical Services (animal modeling experiments)

STCS also delivers impact nationally and internationally with additional programs that offer field support, contribute to the protection of Canada's biosecurity, and promote national capacity building for timely lab-based surveillance and reference testing:

- ✓ Microbiological Emergency Response Team (MERT), (an activity under BADD)
- ✓ Laboratory Surveillance and Epidemiology (centralized epidemiology support and Laboratory Liaison Technical Officer (LLTO) programme)
- ✓ Prion Laboratory Services (national Creutzfeldt-Jakob Disease (CJD) surveillance)

Key examples the Division's role in of knowledge translation include:

- Developing curriculum and hosting of Microbial informatics training workshops (*Genomics and Bioinformatics sections*)
- Development work towards a de-centralized MALDI-TOF database that catalogues the NML's extensive and highly unique pathogen culture collection for the benefit of Province/Territorial and hospital diagnostic labs (*Mass Spectrometry & Proteomics section*)
- Microbiological Emergency Response Team (MERT) providing responders across the country with training and preparedness exercises for dealing with potential biological emergencies (*Bioforensics Assay Development and Diagnostics (BADD) section*)
- Laboratory Liaison Technical Officer (LLTO) programme, which offers surge capacity support for surveillance and microbiological reference testing to strengthen national and provincial public health capacity (*Laboratory Surveillance and Epidemiology section*)

In general, the Division provides robust, centralized technical infrastructure, and, its aims to translate applied and discovery research into better public health security and response. This way, the Agency can achieve the most efficient and forward-looking public health security delivery possible for Canadians.

Bioinformatics

The Bioinformatics Section, led by Dr. Gary Van Domselaar, provides NML programs, collaborators, and stakeholders with scientific and technical support, infrastructure, innovation, and development in bioinformatics involving the large scale storage, management, analysis, and reporting of biological data sets.

The Bioinformatics Section strives to achieve the mandates of the NML, Branch, and Agency by pursuing the following *Objectives*;

- Support NML Programs, Branch Centres, Labs, and external science partners in the application of bioinformatics technologies for public health surveillance and diagnostics.
- Engage in collaborative applied research with NML scientists and external science partners to support the development of innovative new therapies, treatments, diagnostics, and surveillance systems.
- Generate new knowledge products, and provide leadership in knowledge translation of these products via training programs, participation in national and international conferences and consortia, and through authoring scientific publications, patents, software and databases.

In meeting these objectives, the Bioinformatics Section carries the following primary *Functions*:

- *Core Technical Service to NML Program Areas* – The Bioinformatics Section incorporates a 'Hub-and-Spoke' model for delivery of core technical services: sophisticated bioinformatics analysis requiring custom data analysis pipelines, software tools development, and high performance computing are centralized within a core group of highly specialized bioinformaticians and computational biologists. Custom training is provided to scientists in NML program areas to collaborate with the core group of bioinformaticians, thus enabling the program areas with advanced bioinformatics and computational capacity while freeing their scientists to focus on the biology and important public health applications rather than the technology required to achieve them.
- *Collaborative Applied Research* – The Bioinformatics Section provides advanced computing infrastructure, scientific and technical capacity, and programming ability to applied research collaborations undertaken with NML scientists, Branch scientists, and external scientists .
- *Knowledge Translation Leadership and Capacity Development* – The Section focuses its knowledge translation activities on getting genomics, proteomics, and bioinformatics technologies out of the lab and into the front lines of public health response. It does this primarily through the provision of training programs, participating in national and international conferences and consortia, and authoring software, databases, analysis methods, scientific journals, book chapters, and patents.

The biological sciences are undergoing a revolution due to the emergence of ultra-high throughput sequencing technologies. These truly transformative technologies create unprecedented new opportunities for public health research, surveillance, diagnostics, and therapeutics. The main challenge is no longer in the generation of biological sequence data, but in its management and analysis. *Bioinformatics* plays a central role in converting the raw biological sequence data generated by genomics and proteomics—and other 'omics' technologies—into actionable knowledge. The Bioinformatics Section centralizes high performance computing infrastructure with a highly specialized team of computer scientists, computational biologists, and dedicated IT staff to provide world-class capacity for biological data analysis in service of advancing the NML, Branch, and Agency public health priorities.

The vast genomic and proteomic datasets generated at the NML and collaborating labs requires an advanced computing infrastructure to store, manage, analyze, and share. Working in close collaboration with the NML IT program, the Bioinformatics Section operates and maintains a high performance computing environment that is essential to keep pace with the accelerating rate of data generation and to rapidly and accurately distill biological knowledge from this ever-growing mountain of raw data.

The Bioinformatics Section focuses its applied research activities on enhancing the Branch's capacity for investigating pathogen outbreaks. Working closely with the NML, Branch, and Agency scientists, P/T partners, federal partners, and academia, the Bioinformatics Section applies innovative algorithms, pipelines, and data analysis strategies to advance bacterial and viral surveillance, DNA and antibody-based diagnostics systems, molecular mechanisms of antiviral and antimicrobial resistance, and rapid emerging and novel pathogen detection.

For the coming year and foreseeable future, the Bioinformatics Section plans to continue these activities, applying modern bioinformatics infrastructure and advanced computational and data analysis capacity addressing IDPC public health objectives and priorities in antimicrobial resistance, food safety, chronic infectious disease, and emerging infectious disease.

2014-15 Goals, Activities / Outputs

Goal#1 **Support and contribute to NML programs' surveillance and diagnostic activities through the provision of technical services.**

Activities / Outputs

1.1 Contribute ongoing laboratory support in detecting infectious agents and in support of infectious disease investigations via rapid turnaround provision of biological sequence analysis including:

- providing highly-specialized diagnostic services by identifying and characterizing emerging and rare infectious diseases directly by characterizing bulk DNA in clinical specimens;
- identifying molecular fingerprint sequences for foodborne pathogens;
- contributing to the development of a microbial forensics database for the identification of bioweapon-suspect agents for attribution;
- developing computational platforms, methodologies, and analysis pipelines for whole-genome sequence-based surveillance and outbreak response;
- developing and maintaining an online system through LIMS for Genomics and Proteomics Core Facilities.

Goal#2 **Provide national and international leadership in applied research supporting Branch and Agency priorities.**

Activities / Outputs

2.1 Operate and maintain a high-performance computing environment for research and development which involves:

- implementing and maintaining a system for accessing up-to-date, local copies of important biological sequence databases;
- hosting bioinformatics intensive analysis applications (including LASERGENE, Pathway Studio, MASCOT, PEAKS, the Newbler assembler, AMOS, SPIDER, and others.

2.2 Contribute to an improved molecular understanding of bacterial and viral genomics / pathogenomics by:

- developing the infrastructure to assemble, annotate, and compare genomes and provide interpretable reports of the data to facilitate understanding; and
- using this infrastructure and techniques to analyze priority pathogens including *E coli, Mycobacterium tuberculosis, Listeria spp*., methicillin-resistant *Staphylococcus aureus*, *Clostridium difficile*, human immunodeficiency virus (HIV), herpes simplex virus, influenza, and others.

2.3 Contribute to molecular understanding of bacterial and viral communities by developing software capable of analyzing whole genomes including multiple genomes simultaneously (metagenomic analysis). This includes:

- designing and developing software to assemble sequences for viral variant (quasispecies) analysis;
- designing and developing software capable of analyzing multiple different genomes in a microbial community from a broad-based sequencing approach (microbiome shotgun community metagenomics profiling)

2.4 Contribute to the discovery of new therapies and treatments by:

- participating in the development of a heterosubtypic antibodies for detection of influenza virus and respiratory syncytial virus.
- contributing to the analysis of responsiveness and non-responsiveness of hepatitis C virus to modern therapeutic regimens using a whole-genome analysis approach.

- investigating mechanisms of acquisition of antiviral resistance in HIV infected individuals and populations.

2.5 Contribute to advancements in molecular fingerprinting analysis of bacteria and viruses by developing databases and software for molecular typing using advance techniques (e.g., whole genome sequencing).

2.6 Lead the Bioinformatics Theme of the inaugural Genomics Research and Development Initiative (GRDI)'s funded interdepartmental pilot project entitled, "Strengthening Food and Water Safety in Canada through an Integrated Federal Genomics Initiative" (also known as the CRDI FWS Pilot). Key Bioinformatics Theme outputs include the development and implementation of a National Genomics Database (NGsD) to store and search pathogen data and associated metadata to assist enhanced traceback analysis during public health events.

Goal#3 Providing knowledge translation of genomics, proteomics, and bioinformatics technologies and sciences in service of advancing Canadian and global public health.

Activities / Outputs

3.1 Develop an IT model and policy for research computing at PHAC and other Canadian government departments and agencies.

3.2 Work with NML IT staff towards certification and accreditation of the bioinformatics computing infrastructure.

3.3 Collaborate with provincial, national, and international public health partners, to develop data and metadata standards for genomics and bioinformatics applications in disease surveillance and outbreak response

3.4 Participating in international working groups and scientific advisory boards to develop global solutions for whole-genome based infectious disease epidemiology, surveillance, and outbreak response

3.5 Expand and promote the science of bioinformatics locally, nationally, and internationally by:

- attending conferences, participating in national and international collaborations;
- contributing to the development of an undergraduate and graduate bioinformatics curriculum at the University of Manitoba by supervising local and international graduate students in bioinformatics; and
- preparing and delivering lectures and scheduling speaking engagements.

3.6 Develop and deliver workshops in bioinformatics, genomics, and high performance computing to internal and external stakeholders.

Genomics

The Genomics Section, led by Chief Dr. Morag Graham, provides NML programs, collaborators, and stakeholders with technical support and applied niche and collaborative research involving molecular-based assays and sophisticated genomics technologies. Via national leadership, the Section also adds important, value-added knowledge translation products and training activities for the Branch and for its networks of collaborators and stakeholders.

Supporting NML's Core Functions, as well as working with Branch Centres and Labs to achieve IDPC Objectives, the Genomics Section's objectives are to:

- support Branch Centres and Labs in applying genomics science and technologies in public health reference service, diagnostic, and surveillance activities
- contribute to and support applied research conducted by Branch programs aimed at improving diagnosis, treatment and prevention of infectious diseases
- conduct forward-looking, genomics-based research in support of advanced public health response and delivery and other priority issues
- create new knowledge products and provide knowledge translation leadership to advance Branch priorities and enhance capacity on behalf of our stakeholders

The primary functions of the Genomics Section are:

- *Core Technical Service to NML Program Areas* - Acting as a centralized core resource to program areas, our genomics-based technical services (representing high-value and highly specialized resources) enable rapid and accurate detection and characterization of infectious agents for mandated surveillance, reference services, and diagnostic activities.
- *Collaborative Applied Research* - Public health response capacity is strengthened and advanced via multidisciplinary, collaborative effort in applied research. The Section provides genomics infrastructure, technical capacity and strategic expertise, which are leveraged to undertake large-scale projects aimed at resolving outstanding public health questions – *often complex and not addressed by others*. For example, providing information on infectious disease risk or treatment biomarkers, insights into how pathogen populations are responding to public health interventions such as drugs and vaccines, and providing new means to impact public health (e.g., enhanced early detection assays).
- *Applied Public Health Genomics Research* – The Section delivers national leadership and its own applied research aimed at validating and deploying (operationalizing) genomics in support of enhanced public health delivery and infectious disease response for Canada. For example, we research standardized, quality-assured methods and then operationalize them for broader deployment on behalf of the NML and its stakeholders (e.g., DNA extraction and small sample sequencing procedures are optimized and augmented for scale-up; then applied in large-scale projects with robust and reproducible results; the procedures are then de-centralized by sharing them with our stakeholders such as PulseNet partners). The Section also works with other Branch scientists to better integrate genomic and population genetic, clinical and epidemiological data to monitor evolutionary changes in pathogens, thereby accelerating the development of much-needed genomic surveillance tools and biomarkers. Genomic surveillance provides useful reconnaissance for disease surveillance and control efforts (infection trace back).
- *Knowledge Translation Leadership and Capacity Development* - The Section has nurtured a strong learning culture and outreach program. Our genomics knowledge users represent Branch technical staff, external stakeholders (e.g., P/T public health labs), collaborating academics and (in general terms) knowledge users within the fields of infectious disease and public health promotion.

Pathogens are constantly evolving to evade host immune systems and the public health interventions designed to combat them (such as antimicrobials). *Genomics* plays an important in understanding this complex evolutionary arms race. Modern DNA sequencing technologies allow scientists to assemble the whole genomes of pathogens—that's their entire DNA sequence—quickly and at a relatively low cost. Essential systems are now in place to isolate and sequence pathogens from many thousands of clinical samples per year. From this influx of raw genomic data, we can unearth complex insights into how pathogens bypass our host defences.

Genomics technologies, analytics (data mining) and genomic surveillance are rapidly evolving fields and the principal drivers for our Section. Via a number of internal and external

collaborations, the Section develops infrastructure—*scientific, technical and institutional*—essential to apply the full power that genomics has to offer in the fight against infectious diseases.

The NML's Genomics capacity, together with Bioinformatics (data analysis) capability is enhancing the Branch's ability to investigate pathogen outbreaks. Acquisition of molecular test results and pathogen genome sequences also enable design of new assays for rapid deployment in the field. Enablement of such *de-centralized* testing contributes immensely to public health response and promotes infection traceback by distinguishing related infections from un-related infections and narrowing the focus of infectious disease investigations.

Genomic surveillance entails the monitoring of evolutionary changes in pathogen populations and can provide crucial insights into how pathogen populations respond to public health interventions. Discovery of distinct gene variants associated with drug resistance in pathogen populations [e.g. *Clostridium difficile* (bacterium) and HIV (virus)] represents important lab evidence needed for revision of public health policies.

The Genomics section contributes work that addresses numerous ongoing IDPC corporate risks and public health priorities:

- *antimicrobial resistance*
- *food safety*
- *vector-borne diseases*
- *pandemic influenza*
- *tuberculosis*
- *chronic disease such as Hepatitis and HIV*
- *and other emerging infectious diseases, including those in vulnerable populations*

In 2014-15 and beyond, the Genomics Section will continue its priority activities applying genomics to generate lab evidence, enhanced knowledge, and implement genomics tools to real-world efforts in fighting illness.

2014-15 Goals, Activities / Outputs

Goal#1 **Support and contribute to Branch public health surveillance, reference service, and diagnostic activities through timely provision of quality scientific technical services.**

Activities / Outputs

1.1 Contribute ongoing laboratory support in detecting infectious agents and in support of infectious disease investigations via rapid turnaround provision of quality reagents [namely, synthetic DNA and probes, molecular templates] genomics-based data sets [molecular test results; DNA sequencing] and services [robotic liquid handling; genomics technical consulting].

- *new FY2014-15 activities*: pursue ISO 9001 registration and accreditation for client-based DNA sequencing; initiating preparations for ISO 9001 accreditation of DNA synthesis operations

1.2 Maintain technical capacity (high throughput / rapid turnaround genomics-based capabilities) in support of short-notice priority events requiring CSL-2 laboratory support. (e.g., surge capacity for PulseNet Canada *E. coli* O157 MLVA testing; robotic sample processing for rush virus testing, and other high-throughput molecular analyses).

1.3 Contribute ongoing laboratory support (human genomic DNA plate reformatting) to the biorepository of the *Canadian Health Measures Survey* (CHMS; Statistics Canada)

1.4 Contribute ongoing laboratory support, including viability testing, for live patent depositions for the *International Depository Authority of Canada* (IDAC)

Goal#2 Support and contribute to Branch Programs and Agency priorities via high technology capacity for complex biological research and sophisticated molecular analyses.

Activities / Outputs

2.1 Actively contribute genomics data and technical support to Branch Programs and broader applied projects addressing a broad range of public health issues, such as:

- Perform complex molecular characterizations applying high technology resources
- Apply genomics technologies to characterize pathogen populations (e.g., genetic variant analyses)
- Generate high-quality pathogen reference genomes that serve as fundamental resources for other investigative activities (e.g., determination of reasons for antimicrobial resistance, pathogen virulence, environmental persistence or molecular pathogenesis)
- Conduct joint analysis of pathogen and human phenotypes to investigate Branch priorities (e.g., characterization of host innate immune responses; reasons for host susceptibility to disease; determination of risk biomarkers)

These activities aim to provide the Branch and stakeholders with the following outputs:

- *Contribute to enhanced diagnostic, detection and surveillance strategies for infectious disease threats (emergent, drug-resistant or bio-engineered agents*)
- *Contribute superior molecular-based approaches to pinpoint disease clusters and conduct discriminatory outbreak investigations (enhancing public health response and outbreak management)*
- *Augment Branch and stakeholder capacity and turnaround for characterizing disease risk*
- *Provide laboratory evidence to link to public health action and/or policy development*

- Pending **supplementary funding renewal** [*Genomics Research and Development Initiative* (GRDI) Round 6]: Contribute genomics infrastructure and strategic expertise to all funded Branch intramural GRDI Round 6 projects, as appropriate.

Goal#3 Provide national leadership via applied genomics research in support of infectious disease prevention / control and enhanced public health delivery / response.

Activities / Outputs

3.1 Conduct genomics technical development work to improve public health response to emerging health risks.

- Evaluate and implement molecular technology for application in public health response, diagnostics and surveillance

- Validate new lab workflows and optimize lab protocols for enhanced data output and quality under time restraints (Improved turnaround)

3.2 Actively lead and participate in applied genomics collaborations: Actively contribute genomics data; genomics support and strategic expertise to applied projects addressing public health priority issues; Partner with Branch programs, Agency and broader federal entities, provincial/territorial and international public health partners (US Centers for Disease Control), and with academia.

- Develop data analysis tools and validate for enhanced data interpretation (genomic epidemiology) in support rapid public health response. Similarly, contribute to data analysis frameworks and methods for analysing pathogen phenotypes in structured populations. This is accomplished through genomics expertise contributions to the NML's own Public Health Genomics Program, as well as to others:
- Contribute genomics expertise to a Genome Canada-funded project entitled "*Federated Bioinformatics Platform for Public Health Microbial Genomics*" for integrated rapid infectious disease analysis (IRIDA), in support of enhanced genomic epidemiology analysis.
- Contribute to a Genome Canada project entitled "*Listeria Detection and Surveillance using Next Generation Genomics* (LiDS-NG)" to provide enhanced diagnostic capacity to Canada's public health labs and meat processors.
- Apply genomics to complex microbial communities and environmental samples. E.g., contribute laboratory support, microbiome data sets, data analysis and interpretation from human stool specimens to a new, Manitoba industry-funded, human microbiome analysis studying potential benefits of dietary fibre intervention on human gut microbial communities (the gut microbiome) and overall health of elderly adults in care homes.
- ***Pending*** **supplementary funding renewal** [*Genomics Research and Development Initiative* (GRDI) Round 6:
  - Coordinate ongoing laboratory and theme efforts [as Co-lead of the *Information Generation Theme*] for the large-scale pilot project entitled, "*Strengthening Food and Water Safety (FWS) in Canada through an Integrated Federal Genomics Initiative" funded 2011-2016* (also known as the GRDI FWS pilot)*. With >53 scientists from six federal Departments / Agencies, this interdepartmental research pilot represents the largest collaborative effort in Canada to date aimed at addressing a nationally shared priority (namely, Food and Water Safety)*

Goal #4: Serve as a knowledge exchange hub by providing formal and informal knowledge translation (KT) products to genomics knowledge users.

Activities / Outputs

4.1 Provide synthesis of genomics knowledge

- Conduct in-house validations of genomics technologies / protocols and adapt them for broader priority Branch applications and stakeholder deployment

4.2 Provide exchange and feedback for genomics knowledge

- Provide national genomics leadership (e.g., via collaborative funding applications, strategic planning, briefings and project advisement)

4.3 Mobilize and disseminate genomics knowledge

- Generate and contrite to genomics data interpretation
- Contribute to internal documentation and peer-reviewed outputs
- Contribute to oral presentations and lectures (both internal & external)
- Develop highly-qualified personnel (HQP; representing Branch staff, collaborators and stakeholders, academia and students) via consultation, guidance, training and active participation on committees
- Contribute to formal workshops on microbial bioinformatics analysis and molecular data interpretation
- Contribute *Genomics* block lecture and expertise for graduate-level *Microbial Pathogenesis* course MMIC 7050 at the Department of Medical Microbiology (University of Manitoba)

Molecular Pathobiology

The Molecular Pathobiology Section, led by Dr. Stephanie Booth, carries out diagnostic pathology and employs an array of multi-disciplinary techniques to understand the pathogenesis of infectious diseases in animal models. By harnessing state-of-the-art technologies to study the pathophysiological and pathogenetic mechanisms that underlie human infectious disease, particularly those that affect the brain, the section aims to translate fundamental data to improve diagnosis, treatment, and prevention.

2014-15 Goals, Activities / Outputs

Goal#1 **Contribute to NML surveillance, reference services, diagnostic activities and research activities by maintenance of core pathology client services.**

Activities / Outputs

1.1 Develop and enhance specific methodologies to detect infectious disease organisms through pathological analysis of animal tissues:
- Tissue processing, embedding and sectioning fixed or frozen tissue
- Histopathology
- Immunohistochemistry
- Manufacture of tissue microarrays
- Laser scanning confocal microscopy
- Quantitative image analysis
- Laser capture microdissection

1.2 Develop and improve methodologies to detect and analyse pathogen and host genetic material from ultra-low volumes of tissue and bodily fluid samples

1.3 Maintain a sample archive and associated database, including scanned images of pathology slides for future reference.

1.4 Ensure accessibility to pathology and microscopy equipment by maintenance and updating of equipment.

1.5 Provide training in laser scanning confocal microscopy and image analysis.

Goal#2 **Contribute to improvements in laboratory detection and reporting of infectious disease by developing, validating and disseminating diagnostic innovations**

Activities / Outputs

2.1 Determining biomarkers to track disease progression in prion diseases and neurological disorders with a viral cause. A major focus of the section is to determine markers for accurate, preclinical diagnosis of disease in neurodegenerative disorders.

2.2 Developing tools that accelerate development of therapeutics in animal models of infection by innovations in imaging technologies.

2.3 Validating a cellular infection assay (scrapie cell assay) for sensitive detection of prions in cell culture

2.4 Preclinical development of non-coding RNA-based therapeutics for infections of the central nervous system.

2.5 Identification of single nucleotide polymorphisms as biomarkers of mental and neurological disorders.

2.6 Validating the diagnostic efficacy of small non coding RNA molecules as biomarkers of infections of the central nervous system. A key study is to investigate whether microRNAs can be used as markers for the diagnosis and prognosis of neurological disorders.

2.7 Share data with peers via reviewed publications, conference presentations and seminars.

Goal#3 **Provide leadership in pathobiology research and innovation.**

Activities / Outputs

3.1 Promote and facilitate collaboration within NML and with external national and international laboratories and industry. Project examples include:

- Developing proteomic methodologies to identify microRNA targeted genes with Thermo Fisher Canada and the NML Proteomics Core facility
- Developing high-throughput techniques to screen clinically relevant neuroprotective molecules in collaboration with the Division of Neurodegenerative Disorders, St Boniface Hospital
- High-though put sequencing of microRNAs as biomarkers of the human prion disease Creutzdfeldt-Jakob Disease in collaboration with international partners.
- In vivo fluorescence imaging of cytomegalovirus and evaluation of tissue imaging mass spectrometry as a tool to identify immune-related biomarkers in collaboration with researchers in German and the NML Proteomics Core facility.

3.2 Train highly-qualified personnel including graduate students and postdoctoral fellows in infectious disease pathobiology.

3.3 Providing leadership in prion diseases by sharing data via peer-reviewed publications and presentations and transfer knowledge via training and prion lectures for the University of Manitoba's graduate level *Microbial Pathogenicity, Molecular Neurosciences, Pathology and Virology* courses.

3.4 Demonstrate national and international leadership by participation on journal editorial boards, peer-review committees including CIHR and European funding initiative, collaborative funding applications and educational initiatives.

Mass Spectrometry and Proteomics

The Mass Spectrometry and Proteomics (MSP) Core Facility, led by Dr. Garrett Westmacott, enables NML and its partners ("users") access to cutting-edge technologies in mass spectrometry (MS) and proteomics for the better detection and characterization of infectious diseases and biological agents.

As a core facility the Section provides efficient use of high-value resources and highly specialized expertise through sharing and centralization. This maximizes cost-savings in capital and HR for the Agency, while freeing users to focus on the biology and important public health applications rather than the technology itself. In this leadership role, the Section is a vital hub for information, knowledge, and training for this rapidly changing technology.
The Section's core MS and proteomic technologies are focused on reference/diagnostic services and innovative application development.

In support of diagnostics, these core technologies enable the NML unique and rapid response for routine diagnostic services and for emergency/outbreak events—a capacity not yet held by other diagnostic labs in Canada.

In support of innovation, the same core technologies (doing double-duty) are aimed towards developing new and better applications for detection, prevention, and treatment of disease caused by pathogens or biological agents.

In support of the broader NML objectives, the Section has identified the following Goals/Objectives and associated activities to fulfil its unique national role:

2014-15 Goals, Activities / Outputs

Goal#1 **Provide leadership, training, networking, capacity development for the NML and partners on cutting-edge MS and proteomic technologies; AND, as a core facililty, provide efficient use of high-value resources and highly specialized expertise through sharing and centralization.**

Activities / Outputs

1.1 Provide leadership and support to Canadian diagnostic labs for rapid identification of bacteria and mycobacteria by MALDI-TOF MS. *Ongoing.*

1.2 Build a National MALDI Database (NMD) to empower Canadian diagnostic labs to detect rare and new microbes previously only identified at the NML. *New*

1.3 Expand and develop the NML's capacity for cutting-edge MS and proteomic technologies by designing and establishing a new lab area at JC Wilt for the Mass Spectrometry & Proteomics Core Facility. This expansion into JC Wilt will help the NML meet the growing need for LC, MS, and proteomic technologies and applications. *New & One-time.*

1.4 Install and setup two new MS systems; QTRAP and Q-Exactive. QTRAP will support targeted detection and quantification of known or putative biomarkers (eg, toxins), while the Q-Exactive will support proteomic pathogen characterization applications (eg, antimicrobial resistance characterizations). *New.*

1.5 Update CutieQC to version 2.0 for better and automated quality control (QC) data tracking. *New*

1.6 Operate and maintain a core facility with shared and centralized LC systems, MS systems, software and related equipment and standard operating protocols (SOPs); including, QC tracking, column packing,

inventory tracking, SOP updating, and data management and processing. *New*

1.7 Provide a hub for information, knowledge, and training; including, training staff and students, host regular users' meetings, provide a shared lab space for inter-group work, and facilitate contact with other field-experts in MS and proteomics. *Ongoing*.

Goal#2 Provide technical services and support for reference and <u>diagnostics</u> using cutting-edge MS and proteomic technologies to enable the NML unique and rapid response for routine diagnostic services and for emergency/outbreak events.

<u>Activities / Outputs</u>

2.1 Provide the following core technical services and support. *Ongoing*.
- Identification of unknown proteins
- Rapid identification of bacteria by MALDI-TOF MS
- Rapid H-typing of *E. coli* Unknown/emerging pathogen identification using shotgun proteomics

2.2 Support MALDI-TOF MS accreditation for rapid identification of bacteria through developing standard operating protocols. *New*.

Goal#3 Collaborate and co-author with users on the <u>innovation</u> and development of cutting-edge methods using MS and proteomic technologies for new and better options for detection, prevention, and treatment of disease caused by pathogens or biological agents.

<u>Activities / Outputs</u>

3.1 Provide the following core collaborative services and support. *Ongoing*
- Protein identification
- Proteomic differential expression analysis
- Whole/intact-protein profiling
- Post-translational modification analysis
- Protein-protein interaction analysis (via protein identification service)
- Peptide fractionation

3.2 Antimicrobial resistance mechanisms and detection:
- Better understand metronidazole- and vancomycin-resistant *C difficile*. *Continuing*.
- Evaluate early detection of carbapenem resistance by MALDI-TOF MS. *Continuing*.
- Better understand mechanisms of antibiotic-resistant Neisseria gonorrhoeae. *New*

3.3 Characterize virulence and toxin expression regulation in food-borne pathogens, especially, *E Coli*, aimed at rapid STEC detection. *Continuing*.

3.4 Develop and test new methods for targeted detection and quantification of known or putative biomarkers, eg, toxins and biological agents of interest. *New*.

3.5 Develop and test new methods for MALDI-TOF MS tissue imaging for supporting molecular histology and better characterization of neurological disease. *New*.

3.6 Evaluate new nanoflow LC/MS/MS methods (see below) to increase detection sensitivity, improve turn-around-time, and improve run-to-run reproducibility. *New*.
- DMSO (chemical) additive for enhance nanospray ionization.
- Bi- and tri-phasic nano-LC columns in-line 2D-LC/MS/MS.

3.7 Develop and test pipeline for unknown or emerging pathogens detection combining proteomics and genomics data. *Continuing & Pending funding*.

Bioforensics Assay Development and Diagnostics

The Bioforensics Assay Development and Diagnostics (BADD) Section, led by Dr. Cindi Corbett, focuses on:

- ✓ providing specialized diagnostic CL-3 reference services for emerging bacterial diseases
- ✓ improving Canada's capacity to respond to acts involving bioterrorism or biocrime, through:
  - creating integrated response network (Canadian Laboratory Response Network)
  - providing PHAC / NML's mobile laboratory response capabilities
  - participating as a core member of the Canadian National CBRNE Response Team
- ✓ providing emergency outbreak preparedness and response
- ✓ developing novel immunoreagents and assays to enhance detection, diagnostic and therapeutic immunoreagent capabilities developed within Canada

The Bioforensics Assay Development and Diagnostics section of the NML is responsible for the Government of Canada's operational biological security response and is part of the National CBRNE team under mandate of Emergency Management Act, as outlined in Emergency Support Function #5 of the Federal Emergency Response Plan. The BADD section meets this obligation via: Directorship of the Canadian Laboratory Response Network; Leadership of the Microbiological Emergency Response Team (MERT), that can provide biological response capabilities anywhere in the world; leadership regarding Canadian Microbial Forensics initiatives; and reference and diagnostic support to our P/T clients. Indeed, BADD are world leaders in biological security response and have strong collaborations with the Royal Canadian Mounted Police, Defence, Research and Development Canada, US Department of Defense, US Department of Homeland Security, US Federal Bureau of Investigation, Department of Foreign Affairs, Trade and Development, and the Canadian Food Inspection Agency.

Within BADD, the Monoclonal Antibody (mAb) laboratory is a core service aimed at creating a centre of immunological excellence to support Agency diagnostic and reference programs via the development of novel or otherwise unavailable and cost-prohibitive immune-reagents. The activities of the mAb laboratory contribute directly to the detection, prevention and control of infectious disease outbreak capability and capacity within the Agency. This capability is utilized to ultimately protect the health of Canadians. Furthermore, the mAb laboratory core facility contributes to the development of the Agency's dedicated, professional workforce by ensuring a supportive culture and equipping it with the tools and leadership it requires through the development of protocols, procedures to provide our clients with novel assays against infectious disease agents. Ensuring Canadian developed assays are available lends Canada independence in times of need and demonstrates infectious disease response leadership within Canada and abroad.

Goal#1 **Contribute to the control of high consequence bacterial disease threats through laboratory diagnostic and reference services.**

Activities / Outputs

1.1 Conduct specialized diagnostic CL-3 testing on behalf of F/P/T laboratories and international CL-3 laboratories including:
- molecular and classical phenotypic identification of culture isolates
- sequence-based species identification;
- susceptibility testing of isolates; and
- *B. anthracis* serology reference service for provincial partners.

1.2 Maintain and expand accreditation of laboratory operations and facilities under ISO 17025 by:
- developing additional SOPs to strengthen laboratories' quality management system for reagents, equipment, test procedures and training plans;
- internally monitoring competencies to support the continuous improvement provisions of NML internal and external quality assurance processes; and
- participating in national and international proficiency programs (e.g., EquATox, GHSAG, CDC-LRN proficiency tests) to ensure highest levels of laboratory competence.

1.3 Advance the diagnostic capacities by consulting and collaborating with other experts in the development of technologies, including molecular strain typing, rapid full genome sequencing and mass spectral analyses.

Goal#2 **Create a core service of excellence to enable the development and production of monoclonal antibodies (mAbs) for support of infectious disease diagnostics.**

Activities / Outputs

2.1 Develop and produce monoclonal antibodies for the diagnosis and potential treatment of viruses, toxins, bacterial pathogens and other targets, which include:
- developing needed / improved diagnostic tests and new prevention / treatment strategies for infectious disease threats as per client requests;
- producing reagents for co-validation with other NML programs;
- developing reagents and collaborating with national / international partners to address capability gaps, as well as reagent and knowledge transfer; and
- developing novel assays for which there are capability gaps within Canada.

2.2 Produce immunoreagent (recombinant antigens) for the development of diagnostic assays.

2.3 Utilize and train staff in antibody development methods to:
- address emerging viral, bacterial, toxin or prion pathogens important to Canadian public health; and
- reduce the reliance on foreign suppliers.

2.4 Provide viability testing of hybridoma cell culture for the International Depositary Authority of Canada

Goal#3 **Provide leadership and coordination for infectious disease practices and processes by building capacity among federal and provincial response capabilities.**

Activities / Outputs

3.1 Provide leadership and direction of the Canadian Laboratory Response Network (CLRN) via:
- development and fostering of provincial partnerships;
- provision of the unique Canadian LRN structure;
- providing a yearly viable containment level 3 pathogen proficiency panel to CLRN partner laboratories and GHSAG laboratory network members;
- provide guidelines, training and expertise in diagnostic testing procedures that require CL-3 containment by conducting wet laboratory workshops for CLRN diagnostic laboratory staff.

3.2 Provide a 24/7 response to queries from public health and law enforcement stakeholders with established contact details.

3.3 Conduct exercises with CLRN member laboratories to: facilitate local law enforcement and CLRN member laboratory interaction; test the response of the CLRN and aid in verification of communications protocols and roles.

3.4 Maintain Canada's level of preparedness to response to intentional biological events via:
- continued provision of Bio-Basics and BioAdvanced courses for the National CBRNE team, ensuring appropriate sampling protocols are in place ot meet safety, analytical and forensic standards that can withstand legal scrutiny.

3.5 Continued leadership of Canadian Microbial Forensics Initiatives via:
- participation in International Microbial Forensics Initiatives and collaborative projects;
- host the International Microbial Forensics Workshop in turn with the Quadrilateral allied countries of the AUSCANUKUS;

3.6 Continues leadership of Canadian operational biological security via:
- provision of leadership to the Biological Community of Practise of the Canadian Safety and Security Program
- public health leadership within the Quadrilateral CBR 4x2 Medical Counter Measures Consortium Point of Care diagnostics sub-group

Goal#4 **Contribute to Canadian and global emergency preparedness and response against emerging pathogens and malevolent use of biological agents and toxins.**

Activities / Outputs

4.1 Participate in the National CBRNE Response team, including;
- provision of 24/7 biological reach back and advise to the RCMP as members of the National CBRNE team
- participation in National and International response team exercises as a member of the National CBRNE response team
- maintain of our deployment capabilities when requested
- maintenance of a Memorandum of Understanding with the RCMP regarding biological support

4.2 Support national security operations in the context of the National CBRNE team for mass gathering or high-profile events.

4.3 Support national security operations via our testing capabilities and microbial forensics initiatives via:
- acceptance of material for biological triage from law enforcement

- provision of HPTA analysts and laboratory capacity.

4.4 Advance the Microbiological Emergency Response Team as a national and international public health and biological security resource via:
- maintenance of mobile laboratory capabilities, for pre-planned, expeditious and immediate deployment via maintaining a state of readiness for our mobile CL-3 truck, mobicon and laboratory in a box, respectively;
- development and maintenance of SOP's for national and international deployment operations addressing the logistical considerations for different deployment types;
- ensuring all laboratory work conducted whilst on deployment conforms to best forensic laboratory practices;
- providing training for PHAC staff to maintain a qualified pool of individuals that are capable of laboratory deployment;
- participation in National and International field exercises to enable proper training of staff, and ensure we have all capabilities in place to deploy when requested.

4.5 Advanced the Agencies capabilities for toxin analyses of samples of National Security Concern;

4.6 Oversee and ensure provision of biological triage of suspicious packages within the National Capital region in collaboration with the RCMP Integrated Response Team.

4.7 Develop partnerships with federal stakeholders including PSC, RCMP, DRDC by:
- providing input into Federal emergency response plans;
- exercising response to biological events with our F/P/T national partners to ensure synergy in response capabilities within Canada;
- establishing joint concept of operational guidelines for PHAC and the National CBRNE team \to be utilized by Public Safety Canada for the Federal CBRNE Response Plan.

4.8 Develop and maintain partnerships with international organizations such as DFATD, GHSAG, the UK HPA, DSTL, Robert Koch Institute, FBI, CDC, TSWG by:
- providing expertise and training to aid in meeting GHSI and GHSA goals;
- collaborating with international partners on joint-response capabilities; and
- participating in international meetings, training courses / exercises / proficiency panels.

Goal#5 Contribute to Canadian public health preparedness through scientific research, innovation and collaboration.

Activities / Outputs

5.1 Study of emerging bacterial organisms related to current biothreat agents;
- novel strains of Bacillus that harbour both virulence plasmids
- ensure tools and techniques are available to detect, and characterise these variant organisms

5.2 Develop recombinant and synthetic antibody-based strategies for novel immunoreagant development:
- developing and producing recombinant monoclonal and murine and human monoclonal antibodies;
- assessment of B cell sorting and novel IgM cloning synthetic antibody development strategies

- training students and staff in recombinant antibody technology to create pool of expert staff.

5.3 Study of the functional activities of monoclonal antibodies developed for diagnostic assay development to determine their potential for therapeutic lead molecules.

5.4 Assessment of *Yersina pestis* prevalence in black tail prairie dog populations of Grassland National Park.

Triage and testing of any fleas collected by Parks Canada in Spring 2014, including a field deployment to inform the sampling strategy in real time.

Laboratory Surveillance and Epidemiology

The National Microbiology Laboratory (NML) Surveillance and Epidemiology section, led by Dr. Carole Beaudoin, seeks to optimize national capacity for timely, integrated and coordinated public health response to infectious disease threats by providing targeted support for integrated laboratory-based surveillance and public health epidemiology initiatives and activities across NML program areas.

The NML Surveillance and Epidemiology section serves as a focal point to coordinate NML responses to surveillance-related requests and participation in Agency surveillance activities and initiatives, and provides direct support to NML programs for the development and implementation of timely, integrated surveillance models. Through coordination of the Laboratory Liaison Technical Officer (LLTO) field program, the section also enhances national interjurisdictional capacity for pandemic and outbreak preparedness and response by providing deployable, site-based LLTO position support for infectious disease surveillance and microbiological reference services within provincial public health laboratories across Canada.

In alignment with NML Core Functions, IDPC Branch and Agency objectives, and in support of *Naylor Report* recommendations, the section collaboratively engages with public health laboratory and epidemiology partners at the international, national, provincial and regional levels to achieve the following key objectives:

Laboratory Surveillance and Epidemiology Objectives:

- ✓ Strengthen national capacity for timely and integrated public health surveillance, outbreak detection and response by collaboratively supporting NML programs and IDPC Centres in the development, implementation and assessment of laboratory-based infectious disease surveillance activities.
- ✓ Inform public health decision-making by engaging in innovative and applied laboratory-related public health surveillance and research initiatives, as well as knowledge translation activities. Enhance national surge capacity for pandemic and infectious disease outbreak preparedness and response at the national and provincial levels through the provision of strategic Laboratory Liaison Technical Officer (LLTO) Program field support.
- ✓ Advance national public health surveillance integration, transformation, and information sharing activities by providing a focal point for NML participation in national and international working groups, networks and consortia; and through the coordination of NML responses to surveillance-related information requests.

Laboratory Surveillance and Epidemiology Section: Surveillance Integration and Transformation

The timely integration of laboratory, epidemiological and clinical data is of critical importance to effective infectious disease surveillance, outbreak detection and response efforts, as highlighted in the *Naylor Report* and in subsequent reports. Laboratory data play an integral role in national surveillance and outbreak response, with over 90% of nationally notifiable diseases requiring laboratory data to support case confirmation. Data generated through advanced molecular characterization and genotyping methods (i.e. public health genomics) are used by the NML to link outbreak cases with each other, identify outbreak sources; monitor antimicrobial resistance, and conduct strain surveillance to detect changing disease epidemiology and inform national public health action. The role of the laboratory in public health surveillance will only continue to expand with the evolution and increasing availability of molecular techniques.

While laboratory data are required to support epidemiological analysis and public health response, the timely availability of epidemiological and clinical data (e.g. disease onset date, travel history, immunization history) is similarly essential to the laboratory when interpreting test results. Given this interdependence, effective integration of laboratory and public health epidemiology data is an NML priority in keeping with Agency surveillance integration and transformation initiatives. The NML Surveillance and Epidemiology section uses a multi-faceted approach to address this need, working collaboratively with Agency and interjurisdictional partners through a variety of mechanisms to improve the timely integration of laboratory and epidemiological data, information and expertise to strengthen public health surveillance and outbreak response capacity.

2014-15 Goals, Activities / Outputs

Goal#1 **Support the development, implementation and evaluation of integrated, laboratory-based infectious disease surveillance activities, and provide position support during emergency and outbreak responses in collaboration with NML scientific program areas, CNPHI, IDPC Centres and provincial and regional laboratory and epidemiology partners.**

Activities / Outputs

1.1 Complete evaluation of the MARS (measles and rubella surveillance) real-time surveillance pilot project, and draft an executive summary of results for collaborative review and Agency distribution to inform decision-making regarding national implementation of MARS on the CNPHI platform

1.2 Incorporate MARS pilot project results, including national laboratory-based surveillance indicator and attribute estimation, into national efforts to document and verify measles and rubella elimination in Canada in keeping with PAHO/WHO international targets.

1.3 Work collaboratively with NML, CIRID and P/T laboratory and public health stakeholders to implement recommendations for national real-time measles, rubella and CRS/I surveillance

1.4 Provide ongoing laboratory-based liaison and technical support for MARS surveillance coordination by participating Agency and provincial surveillance sites (NML, CIRID, BC, AB and NL).

1.5 Facilitate ongoing collaboration between federal and provincial laboratory and epidemiology stakeholders to support the development and implementation of integrated, real-time laboratory-based surveillance platforms and solutions in alignment with NML and Agency priorities

1.6 Provide leadership and support to the NML Emergency Operations Centre during emergency and outbreak responses as needed

Goal#2 **Collaboratively engage in applied and innovative laboratory-based public health surveillance and research activities, and facilitate data collection and analysis, integration of laboratory and epidemiological data, and knowledge translation activities.**

Activities / Outputs

2.1 Strengthen international research partnerships to improve and increase HIV/STI laboratory surveillance and research in developing countries.

2.2 Support a national investigation of the molecular epidemiology of tuberculosis in Canada's vulnerable populations.

2.3 Provide expertise as requested in the use of social networking tools to integrate laboratory and epidemiologic information.

2.4 Lead a number of HIV/STI research projects aimed at decreasing disease transmission in vulnerable populations, locally and internationally.

2.5 Complete analysis of the results of the MARS real-time surveillance pilot project for presentation and publication in peer-reviewed journals to support knowledge translation regarding the implementation of real-time, integrated surveillance models

2.6 Provide LLTO position support for collaborative, interjurisdictional participation in applied and innovative laboratory-related public health research and method development (e.g. public health genomics)

2.7 Present results and share knowledge and information with public health decision-makers by participating in national and international conferences, symposia, and training events.

Goal#3 **Coordinate the LLTO Program to strengthen national and provincial surge capacity for pandemic and infectious disease outbreak preparedness and response through the strategic provision of surveillance, reference testing, technical and liaison support.**

Activities / Outputs

3.1 Provide flexible, site-specific LLTO technical support to enable timely laboratory-based infectious disease surveillance; microbiological reference testing; and data entry, linkage and analysis to increase national outbreak preparedness and response capacity for:

- Influenza and other respiratory pathogens (e.g., FluWatch, TB surveillance);
- Bacterial and viral enteric diseases (e.g., National Enteric Surveillance Program (NESP), PulseNet surveillance and PFGE testing, comparative genomic fingerprinting (CGF) method development for *C. jejuni,* etc.)
- Measles, rubella and CRS/I (i.e. real-time MARS surveillance using the CNPHI platform)
- Invasive bacterial diseases (e.g. eIPD (invasive pneumococcal disease) pilot);
- Other infectious diseases under national surveillance (e.g. HIV and other sexually transmitted and bloodborne infection (STBBI) surveillance; non-enteric zoonotic surveillance, etc.)

3.2 Provide LLTO liaison support to enable timely interjurisdictional information and data sharing, technology transfer and knowledge translation between the NML and the provincial public health laboratories (PHLs), and between the PHL and provincial public health (i.e. provincial epidemiologists, provincially-located Agency field staff with the Canadian Public Health Service, etc.)

3.3 Identify and prioritize national surveillance, outbreak preparedness and response initiatives and activities for which LLTO support is needed through ongoing discussions with NML programs and epidemiology counterparts within the Agency (e.g. CIRID), as well as provincial public health stakeholders (e.g. Canadian Public Health Laboratory Network (CPHLN)

3.4 Complete the 2013-14 national LLTO staffing process to ensure continuity of site-based LLTO surge capacity support at approved provincial placement sites in keeping with existing Memoranda of Agreement with the provinces (Target: June-July, 2014)

3.5 Monitor LLTO program and position performance, develop mutually-acceptable work plans in conjunction with provincial site supervisors, and participate in LLTO Program review processes as required

3.6 Review and update LLTO Memoranda of Agreement with the provinces as required

3.7 Coordinate the annual 1-week LLTO Program Training Session at NML to support efficient delivery of program-wide LLTO training and skills development requirements, including LLTO participation in specialized laboratory-based training, networking with NML programs to identify opportunities for LLTO support of surveillance and reference-based activities, and participation in an annual LLTO Face-to-Face meeting to discuss program priorities, challenges and opportunities.

3.8 Coordinate position-specific LLTO training in specialized laboratory methods and analytical techniques in collaboration with NML experts to support evolving national surveillance and reference testing needs and facilitate knowledge translation and technology transfer.

3.9 Explore opportunities for site-based LLTO access to, and participation in, skills development and training in the application of basic epidemiology, biostatistics and public health concepts.

Goal#4 Provide NML representation and facilitate the incorporation of laboratory-based input into national and international surveillance activities and initiatives in coordination with NML programs.

Activities / Outputs

4.1 Participate in various Agency working groups engaged in infectious disease surveillance and information sharing activities in order to highlight laboratory-based surveillance issues and considerations, and identify opportunities for improved integration and collaboration (e.g. SIT, PHIEST, MREWG, MLISA, etc.)

4.2 Document NML laboratory-based surveillance data holdings related to infectious diseases under national surveillance, and provide support for NML participation in Agency surveillance review and evaluation processes as required (e.g. surveillance DQF assessment, environmental scans, etc.)

4.3 Present information to and solicit P/T input from the Canadian Public Health Laboratory Network regarding laboratory-related surveillance activities, information sharing considerations and LLTO Program issues on a needs basis

4.4 Facilitate NML Program participation in quarterly International Encephalitis Consortium teleconferences to support information sharing, networking and collaboration amongst regional, provincial, national and international encephalitis stakeholders

Veterinary Technical Services

The Veterinary Technical Services (VTS), led by Chief Julie Kubay, provides containment animal housing, veterinary nursing care, performance of medical techniques, and apply support systems for small experimental animals to enable the research and diagnostic activities of NML, JC Wilt, and NCFAD science programs. In accommodating the small animal procedures of client programs, the facility contributes to the development of knowledge and technologies that strengthen the capacity to detect and respond to infectious disease threats in Canada and internationally on a day-to-day basis or in an outbreak scenario.

2014-15 Goals, Activities / Outputs

Goal#1 **Maintain capacity in VTS CL-2 to perform small animal procedures to enable implementation of approved client animal project submissions for the year 2014/15.**

Activities / Outputs

1.1 Continue to provide veterinary technical expertise (nursing and technical procedures) to complete ongoing and new small animal projects such as Lentivirus studies, HIV prophylaxis studies, Primate animal models, Mouse Cytomegalovirus studies and BLT (Bone marrow, Liver and Thymus) mouse model.

1.2 Continue to provide specific housing systems in CL-2, CL-3 and support CL-4 studies to address studies related to present and emerging pathogens.

1.3 Continue to coordinate non-human primates (NHP) and other exotic species to augment CL-3 and CL-4 project requirements for animal immunizations prior to transfer to CL-4 facilities.

1.4 Continue to support CL-2 prion animal projects. Maintain the scope of projects to include BSE, CWD and other prion agents according to the guidelines for Transmissible Spongiform Encephalopathies (TSEs). This includes implementation and commissioning of the new VTS autoclase and sterilization equipment that meets Prion, NHP and other waste decontamination requirements. Alongside the Molecular PathoBiology lab, continue training activitites on the diagnostic In Vivo Imaging System (IVIS) Spectrum CT Machine.

1.5 Work with Facilities on the continuation of room renovations and commissioning of the new laboratory sterilization equipment (autoclave, cage washer and bottle washer).

1.6 Receiving, implementation, training and start use on the new primate cage systems to better accommodate longer term and more complex NHP studies.

1.7 Work with Facilities to retro-fit the primate room with upgrades such as computer data ports for data collection; low pressure water for animal-enrichment and husbandry.

1.8 Re-visit the VTS unit organizational chart and position descriptions as many of the duties and responsibilities have increase since VTS was first operational.

1.9 Coordinate with J.C. Wilt Lab on logistics of movement of samples for 2014/15 animal projects within the VTS unit.

1.10 Coordinate within STCS on the procurement of a PHAC Crown Vehicle to transport animals from the airport to the CSCHAH.

1.11 Work with accommodations committee for the acquisition of more animal lab space and retrofits such as modifying current lab space into CL-3

animal lab space for work conducted by programs such as the Prion Division Sections.

Goal#2 Continue to ascribe to PHAC directives, NML principles, recommendations of Canadian Council on Animal Care and new 2013 recommendations of the Facility Lab Animal Care Committee for animal care and work for CSCHAH approved animal projects.

Activities / Outputs

2.1 Sign off the MOU between PHAC/CFIA, and ensure that animal care staff in both agencies (in CSCHAH) abide by these principles.

2.2 Maintain the voting membership of VTS staff on the Animal Care Committee to ensure robust representation.

2.3 Continue the standardization of training between both agencies to ensure staff proficiency in treating multiple animal species used in research.

2.4 Continue to involve both PHAC and CFIA Animal Health Technologist, who provide technical services for the PHAC animal projects, in the Medical Surveillance program.

2.5 Facilitate and arrange training through the University of Manitoba and in house through VTS.

2.6 Continue to support CALAS membership for the Animal Health Technologists.

Goal#3 Continue to meet and enhance CSCHAH client service expectations through the implementation of quality management systems and animal training programs.

Activities / Outputs

3.1 Reformat the current ISO 17025 accredited SOPs to ISO 9001.

3.2 Enhance animal records tracking system by Coordinating with IT Services the set-up and operation of in-house software on the corporate network to track and report on animal-related records, with links to CFIA animal care veterinarian, the Level 2 VTS office and researchers in their respective animal projects.

3.3 Continue to develop SOPs and training protocols for the new projects from the various programs, including the CL-4 programs to facilitate studies involving influenza viruses in rodents. These projects include studies involving H1N1 among other influenza strains.

3.4 Continue to assist PHAC and CFIA investigators in animal selection and acquisition specific to their project requirements using approved animal documentation.

3.5 Reduce intermittent resource pressures by increasing job-sharing opportunities within NCFAD, thereby allowing more flexibility in employee exchanges between NML and NCFAD, supported by a comprehensive training strategy and implementation plan.

3.6 Provide lab animal training with special attention to non-human primate training for the Animal Health Technologist within the VTS unit to be able better support the technically advanced animal projects.

3.7 Provide training to VTS Animal Health Technologist and Manager on specialized animal techniques, procedures and complex husbandry required as per approved Animal Use Documents and/or recommendations for the Animal Care Committee.

3.8 Provide project management training to the VTS staff that facilitate and coordinate experimental animal projects.

3.9 Provide CL-4 and Intensive Care Unit Training to the Animal Health Technologists to be able to support projects conducted by NML Special Pathogens.

Media, Wash-up and Specimen Receiving

The Media, Wash-up and Specimen Receiving Section, led by Shafquat Siddiqi, operates a central facility providing NML, CSCHAH and CFIA science programs with high-quality microbiological media preparation, biohazardous waste management, sterilization, and specimen receiving and distribution services. Centralized cell culture core facility is now part of media washup unit, this core facility uses CompacT robot to produce cell lines in bulk to NML. Media prep processes are either fully or semi-automated to maintain consistency in their final product from batch to batch. Red bag biohazardous waste is managed by automated sterilizing and shredding equipment Rotoclave. The Rotoclave is energy efficient, decreases in greenhouse gas emissions, and it reduces 80% utility and maintenance costs that benefit us all in the end.

2014-15 Goals, Activities / Outputs

Goal#1 **Enhance the capacity of media and wash-up facility to safely and effectively meet the growing demand for services from client programs.**

Activities / Outputs

1.1 Continue to work with clients to setup a ground-up operation of the Section's core services at the J.C. Wilt Infectious Disease Centre.

1.2 Acquire new advance plating module for cell culture robot and work with RPSS to modify the current lab space in A Block to accommodate the new module.

1.3 Add new users to NML cell culture user groups to enhance cell culture core NML services to additional groups.

Goal#2 **Enhance the ability to handle and track incoming specimens to NML for day-to-day shipments and for outbreak situations.**

Activities / Outputs

2.1 Continue to cross-train technicians in the Specimen Receiving Unit to handle any future outbreaks and/or an increase in specimen reception activities.

2.2 Continue to enhance the LIMS specimen receiving database module to incorporate specimen reception at NML during future outbreaks.

2.3 Coordinate and implement specimen shipping and receiving services requirements with J.C. Wilt Infectious Disease Centre program directors.

Goal#3 **Continue to maintain and enhance the unit's core services through the implementation of quality management systems.**

Activities / Outputs

3.1 Maintain ISO 17025 accreditation through quality improvement and updating of the Section’s protocols.

3.2 Develop and implement the protocols / documentation necessary to register applicable procedures to the ISO 9001 standard by 2016.

Goal # 4 **Continue to provide Media Wash-up and Specimen shipping/ distribution support services to NML and J.C. Wilt Infectious Disease Centre.**

Activities / Outputs

4.1 Continue to provide standardized bacteriological media and reagents production services to research and diagnostic labs at NML.

4.2 Continue to enhance biohazardous waste treatment methods and reduce biohazardous volume by at least 40% of non-shredded and by 80% of shredded waste.

4.3 Work with LIMS team and CPHLN to improve specimen receiving database and enhance the incoming specimen/packaging tracking to NML.

4.4 Continue to provide centralized biological specimen shipping services to NML and J.C.Wilt clients. This service prepares shipping packages according to IATA standards and TDG guidelines for NML and J.C. Wilt Infectious Disease Centre.

Applied Biosafety Research Program

The Applied Biosafety Research Program (ABRP), led by Dr. Steven Theriault, is responsible for:

- ✓ conducting applied bio-safety research to facilitate advances in laboratory containment, decontamination methodologies, and the development of standards for decontamination
- ✓ facilitating a synthetic biology program to develop biological solutions to biological problems, and advance diagnostic tools for infectious disease.
- ✓ providing scientific expertise to NML / NCFAD related to bio-safety and applied bio-safety research
- ✓ advancing applied bio-safety research at NML, PHAC and NCFAD
- ✓ developing and maintaining collaborations with external stakeholders (national and international) to advance applied research globally
- ✓ developing and delivering advanced biosafety and containment training courses to develop an accredited biosafety program

The ABRP's main focus is to promote the science of biosafety, bio-containment, applied research, and decontamination, to develop stronger nationally / internationally-based knowledge on applied biosafety research and develop training programs to assist in biosafety issues.

2014-15 Goals, Activities / Outputs

Goal#1 **Conduct applied biosafety research to advance laboratory containment and decontamination methodologies developing national standards for decontamination.**

Activities / Outputs

1.1 Publish in peer-reviewed journals findings from ABRP research.

1.2 Provide a standardized approach to disinfectant testing and infectious disease outbreak control.

1.3 Develop a national database of disinfectants to provide provincial, national and international knowledge transfer.

Goal#2 **Facilitate a synthetic biology program at NML to advance infectious disease control.**

Activities / Outputs

2.1 Provide expertise and develop synthetic clones for a variety of uses, including, vaccine development, advanced diagnostics development, and advancing infectious disease control research.

2.2 Develop bacteriophage to disrupt bacterial growth of MSRA, VRE, *C.difficile*, and *B. anthracis.*

Goal#3 **Provide scientific expertise to NML/NCFAD related to biosafety and applied biosafety research.**

Activities / Outputs

3.1 Provide experimentally-based information on the proper decontamination of infectious organism(s) for their removal from containment.

3.2 Provide evidence-based information on the decontamination of foreign human and animal diseases.

3.3 Develop new, faster decontamination strategies for bioterrorism attacks or natural outbreaks.

Goal#4 **Advancement of Applied Biosafety Research at NML, PHAC and NCFAD.**

Activities / Outputs

4.1 Develop a *Coxiella burnetii* research program to evaluate proper decontamination techniques.

4.2 Establish advanced decontamination techniques to contain biological toxin and evaluate the efficacies of decontamination agents against biological toxins.

Goal#5 **Develop and maintain collaborations with national and international stakeholders to provide training and advance applied research globally.**

Activities / Outputs

5.1 Maintain partnership with the International Centre of Infectious Diseases (ICID) to conduct the Canadian Biosafety Symposium and other biosafety-related training courses.

5.2 Establish a WHO collaborating centre for Applied Biosafety Research.

Goal#6 **Develop and deliver biosafety training programs.**

Activities / Outputs

6.1 Develop and deliver a national biosafety training program dealing with emergency response in a high-containment laboratory.

6.2 Develop and deliver a university-based biosafety officer training course which will be the first program of its kind in Canada and the only Canadian program which deals with advancing decontamination methods for infectious diseases.

Prion Laboratory Section

The Prion Laboratory Services Section, led by Dr. David Knox, provides national diagnostic reference services in support of CFZED based surveillance and health care professionals dealing with suspected cases of Creutzfeldt-Jakob Disease (CJD). Comprehensive CJD surveillance also supports the Government of Canada's economic and trade priorities such as securing "negligible BSE-risk" status from the World Organization for Animal Health (OIE).

Prions are not conventional viruses or bacteria, but rather misfolded host proteins. This fact precludes the use of technologies currently applied to the direct detection of other infectious agents. The diagnostic tests provided are based upon altered abundance of host proteins characteristic of prion infection. The absence of a definitive ante-mortem diagnostic test compels PLS to remain engaged in basic and applied research to support novel test development and implementation. The timely and accurate identification of affected Canadians is critical to the development of disease-modifying or preventative therapies.

Specific PLS activities include:

- ✓ provide ISO 17025 accredited laboratory reference services testing for Creutzfeldt-Jakob Disease (CJD) diagnoses.
- ✓ validation and accreditation of novel CJD diagnostic platforms.
- ✓ identification of CJD biomarkers, pathways and pathologic mechanisms.
- ✓ enhance proteomics capacity for ultrasensitive protein detection in body fluids and tissues.
- ✓ public and professional education about prion diseases.
- ✓ training opportunities for undergraduate and graduate students.

2014-15 Goals, Activities / Outputs

Goal#1 Reference and Diagnostic Services

Activities / Outputs

1.1 Provide for the ongoing delivery of existing ISO accredited CJD laboratory testing services
- real-time diagnostic support for health care professionals dealing with suspected cases of CJD by providing protein marker assays and molecular genetics;
- supporting diagnostic and epidemiologic studies by continued biochemical subtyping of human prion diseases;
- assess the benefit of measuring the T-tau/p-tau ratio as opposed to T-tau alone in the diagnoses of CJD;
- achieve ISO accreditation of biochemical subtyping assay.

1.2 Create national CJD data bank.
- achieve improvements and efficiencies in case file documentation by upgrading of sample tracking and statistical reporting to NML LIMS platform.
- cooperate with CJDSS and neuropathology to define LIMS compatible fields for case file data and facilitate the conversion to standard electronic record format.
- collate information stored in PLS records, those of the Creuztfeldt-Jakob Disease Surveillance System (CJDSS) and the neuropathologist in order to establish the complete provenance of each sample in the collection.

Out puts will include: continued utilization of reference services at current levels by health care providers; implementation of LIMS, increased efficiency in responding to inquiries regarding Canadian CJD statistics.

Goal#2 Basic and Applied Research.

Activities / Outputs

2.1 Validation of novel CJD diagnostic platforms.
- optimize and validate Real-time Quaking Induced Conversions assay (RT-QulC)
- harmonize and standardize RT-QulC to international standards through participation in an international consortium organized under the auspices of a Transnational proposal submitted to the EU Joint Programme – Neurodegenerative Disease Research (JPND). The consortium consists of 13 principal investigators from 6 countries including: U.K., France, Germany, Italy, Japan, U.S., and Australia.
- obtain REB approval for use of sample collection in RT-QulC validation studies.

2.2 Identification of CJD biomarkers, pathways and pathologic mechanisms.
- collect tissue and fluid specimens from two different animals models of prior diseases and a transgenic model of Alzheimer's disease at defined time-points in disease progression.
- process samples for genetic, proteomic and histologic analyses.
- identify candidate biomarkers.
- validate candidate markers by assessing diagnostic performance by multidisciplinary longitudinal systemic analyses across different disease models.

2.3 Enhance proteomics capacity for ultrasensitive protein detection in complex specimens.
- country-wide knowledge translation study for MS-H typing of *E. coli* and *Salmonella* in collaboration with Enterics (NML) with direct involvement of provincial laboratories.
- direct detection and quantification of CJD biomarkers in CSF.

2.4 Establish new collaborations
- Dr. Liang Li, Chemistry Department, University of Alberta. Metabolomics, MS/MS analysis of transgenic Alzheimer model serum.
- Dr. Bianli Xu, Scientific Director, Henan CDC, Henan Province, People's Republic of China. Transfer of RT-QulC technology to China and gain access to large cohort of FFI samples.

Outputs: Strengthened technical capacity and scientific leadership.

Goal#3 Development and Training.

Activities / Outputs

3.1 Further the outreach and education for human prion diseases by:
- publishing peer-reviewed manuscripts reporting PLS results and perspectives;
- provide links to TDG training
- conducting professional seminars and information sessions in Canadian centres of medical education;
- make presentations to P/T partners at annual Canadian Public Health Laboratory Network (CPHLN) meetings
- enriching web-based information resources available on the PHAC website;
- responding to requests for interviews with the news media.

3.2 Provide expert consultation on risks of human prion diseases in Canada by:
- maintaining a detailed, up-to-date, scientifically rigorous understanding of the global situation regarding prion diseases;
- briefing the Chief Public Health Officer and Minister of Health on CJD-related issues;
- serving on expert advisory committees for prion-related research and policy; and
- consulting with healthcare institutions regarding CJD infection control.

3.3 Enhance F/P/T coordination regarding human prion diseases by:
- assisting in the development of regulations pursuant to the *PHAC Act*, governing sharing of personal health information in public health;
- continued liaison with provincial Chief Medical Officers of Health to optimize communication between CJDSS and provincial public health authorities; and
- improving the efficiency of provincial reporting of human prion diseases.

3.4 Provide training opportunities for staff, as well as, undergraduate and graduate students.

Out puts: Increased recognition of PLS nationally and internationally by policy and regulatory bodies.

SCIENCE TECHNOLOGY AND CORE SERVICES - Budgets and Staffing

Salary Funding

Annualized Salaries:	$5.757M	
Approved FTEs:	81	
Vacant Approved Positions:	6	(as at June 30, 2014)

O&M Funding

Allocated Notional O&M:	$2.959M (Includes $300K of GRDI funding)	

Canadian Network for Public Health Intelligence

The Canadian Network for Public Health Intelligence (CNPHI) is a comprehensive framework of applications and resources designed to fill critical gaps in Canada's national public health info-structure. Led by Dr. Shamir Mukhi and guided by multi-jurisdictional, program-led working groups, CNPHI has implemented a national, integrated, real-time alerting system, and continues to develop / enhance tools to facilitate the dissemination of strategic intelligence and the coordination of public health responses. CNPHI also collaborates with epidemiological, laboratory and clinical professional communities as well as animal health and environmental health domains to extend and adapt CNPHI tools for provincial and international application. To reach its objectives, CNPHI has organized its activities into six main areas of focus:

- ✓ Knowledge Management
- ✓ Disease Specific and Syndromic Surveillance and Reporting
- ✓ Pan Canadian Alerting and Notification
- ✓ Communication and Collaboration
- ✓ Event Management
- ✓ Laboratory Systems

These areas of focus have a two-fold purpose: to direct CNPHI toward achieving its goals by focussing activities in the areas that will achieve greatest impact; and to organize initiatives and activities into practical categories for implementation and ease of communication.

2014-15 Goals, Activities / Outputs

Goal#1 **Support and contribute to NML programs' reference services and diagnostic activities.**

Activities / Outputs

1.1 Continue the management and evolution of laboratory support applications including package tracking system, laboratory surveillance and other collaboration centres.

1.2 Provide ongoing support and evolution of the laboratory component of the CNISP applications on the CNPHI platform.

1.3 Continue to support the Measles and Rubella Surveillance system (MARS).

1.4 Develop an application for guide to services to provide up to date information of reference diagnostic services that are provided by the NML.

1.5 Develop an application for electronic requisitions for the NML

Goal#2 **Support and contribute to pan-Canadian surveillance activities.**

2.1 Provide support, management and evolution of MRSA, VRE, Influenza, CVC-BSI and CDI surveillance applications in collaboration with CNISP (Canadian Nosocomial Infection Surveillance Program).

2.2 Continue the ongoing evolution of the National Enteric Surveillance (webNESP) application and CLSN collaboration centre for laboratory-based technical collaboration on Enterics.

2.3 In collaboration with CFEZID, continue to maintain the West Nile Virus Surveillance system.
2.4 In partnership with CIRID, continue the evolution and support of the sentinel physician influenza-like illness reporting applications and Influenza Activity Level and Outbreak Reporting System application.
2.5 In partnership with Health Surveillance and Epidemiology Division, continue to implement a hospital-based injury surveillance system.
2.6 In partnership with Canadian Paediatric Surveillance Program (CPSP), continue to maintain and enhance a web-based reporting and analysis system.
2.7 Continue to maintain and enhance the interactive web-based platform for interactive rules and syndrome definition for analysis of laboratory data for animal health.
2.8 Continue to support various collaboration centres.

Goal#3 Support and contribute to pan-Canadian Applied and Discovery Research Activities.

Activities / Outputs

3.1 Continue to maintain and evolve the CEWSplatform for interactive analysis of various data sources.
3.2 Maintain and evolve the KIWI (Knowledge Integration based on Web-based Intelligence) system for integrating information through web-based intelligence.
3.3 Continue to contribute towards research activities supporting infectious disease spread and modeling.

Goal#4 Support and contribute to pan-Canadian emergency preparedness and outbreak response activities.

Activities / Outputs

4.1 In collaboration with CFEZID, CIRID and CEPR, continue the ongoing evolution of the Pan-Canadian Alerting application and promote the inclusion of other modules.
4.2 In collaboration with CFEZID and CIRID, continue the ongoing launch and evolution of the Pan-Canadian Outbreak summaries application for Enteric and Respiratory diseases, promote the inclusion of other modules, and develop user manuals and interactive training modules.
4.3 Maintain and enhance the new Response Centre technology to enable rapid establishment of set of tools for use in response mode.
4.4 In partnership with CFEZID-OMD, implement Outbreak Central to support outbreak investigations.
4.5 Continue implementation of DataFuse technology to support integrated outbreak detection and investigation (in partnership with CFEZID-OMD, NML-Enterics and P/Ts).

Goal#5 Demonstrate national and international leadership in strategic intelligence systems.

Activities / Outputs

5.1 In collaboration with the Alberta ProvLab, continue the evolution of DIAL (Data Integration for All Laboratories) platform as an innovative solution to laboratory-based interpretation, reporting and surveillance; and Malaria surveillance application.
5.2 Continue maintenance and evolution of advanced distributed test management system that facilitates online collaboration amongst multiple labs performing genetic testing in Ontario.

5.3 As part of CAHSN (Canadian Animal Health Surveillance Network), a collaboration with CFIA, support the national BSE surveillance and Scrapie surveillance application. In addition, support adaptation of collaboration centres within animal health domains.

5.4 In partnership with the Water Bureau of Health Canada, continue to play a vital role in launching of the Drinking Water Advisory system across Canada including a partnership with Alberta Environment to continue to maintain and evolve the Water Systems Contacts Management system.

5.5 Continue to develop and implement the GLaD platform.

Goal#6 Maintain the capacity within NML/PHAC to provide efficient and cost-effective access to CNPHI.

Activities / Outputs

6.1 Provide ongoing maintenance and management of CNPHI infrastructure including upgrades, patches, new servers, documentation and backups.

6.2 Continue to implement an automated testing infrastructure to support growing number of tools within the CNPHI platform and increase the overall efficiency and robustness.

6.3 Continue to maintain and evolve support applications to assist users with change management, training and registration processes.

6.4 Continue to maintain and enhance the existing version of access management system to support growing number of applications and users.

6.5 Work on conversion of existing applications to use the WET technology

CNPHI - Budgets and Staffing

Salary Funding

Annualized Salaries:	$1.238M	
Approved FTEs:	17	
Vacant Approved Positions:	3	(as at June 30, 2014)

O&M Funding

Allocated Notional O&M:	$63K	(consider conversion to salaries)

BUSINESS SUPPORT PROGRAMS

Scientific Director General - Executive Offices

The Executive Office of the Scientific Director General, led by Deanna Trudeau, attends to the information directed to and from the Scientific Director-General's office. The area's core services include:

- ✓ maintaining a daily agenda for the Scientific Director-General
- ✓ managing travel arrangements and coordinating international and domestic delegation visits
- ✓ organizing and providing logistical support to the University of Manitoba Fellows rotation program.
- ✓ providing logistical support to NML Management Council
- ✓ providing logistical support to the PHACtually Speaking seminar series
- ✓ managing Access to Information requests
- ✓ managing work procedures
- ✓ tracking of committees and memberships
- ✓ managing the records of the Office of the Scientific Director-General

2014-15 Goals, Activities / Outputs

Goal#1 **Maximize the effectiveness of NML Scientific Director-General.**

Activities / Outputs

1.1 Assist in setting and prioritizing the Scientific Director-General's agenda by:
- maintaining a daily agenda for the Scientific Director-General;
- providing essential information related the meeting (purpose of meeting, location, time, participants list, etc.);
- researching essential background information as required by the SDG;
- liaising with stakeholders, other government departments and universities to coordinate joint meetings; and
- providing logistical requirements for visitor meetings to the facility including facility accesses, presentation preparation and database entry, boardroom bookings, audio-visual requirements, hospitality requirements, visitor escorts, tour requirements, etc.

1.2 Manage the Scientific Director-General's travel arrangements by:
- verifying agendas to determine where/if travel arrangements are required;
- securing logistical requirements such as flights, accommodations, and private car/bus transport;
- calculating travel time, arranging travel itineraries, timelines and meeting agendas; and
- ensuring the SDG is kept informed of ongoing schedule changes while on travel status.

Goal#2 **Enhance the Agency and NML's profile as an international leader in the infectious disease domain.**

Activities / Outputs

2.1 Coordinate international delegation and senior officials' visits to Winnipeg and NML by:

- liaising with the International Affairs Directorate, Minister's Office, ADM's Office and Corporate Services to arrange / confirm visit details;
- gathering, preparing or arranging supporting material such as agendas documents and presentations; and
- providing logistical services such as securing meeting locations, negotiating hotel / facility rates, securing appropriate hospitality, arranging facility access, security clearances and tours.

Goal#3 Enable effective communications, priority setting and decision making within NML.

Activities / Outputs

3.1 Provide logistical support to NML Management Council meetings by:
- preparing and distributing bi-weekly agendas to senior management or their representative(s);
- preparing, collecting and distributing required meeting material / information; and
- organizing science presentations to be delivered at the meeting
- preparing records of decision and ensuring follow-up of all action items at the conclusion of meetings.

3.2 Manage incoming and outgoing information requests by:
- distributing information requests to appropriate individuals on behalf of the SDG for input and information;
- gathering and coordinating feedback for the Scientific Director-General's review / action;
- collecting and coordinating PHAC web inquiries related to NML and forwarding response to Web Coordinator; and
- collecting and coordinating input to a weekly report (Monthly Heads Up Report for the inclusion in branch reports.

3.3 Screen incoming calls and direct enquiries to appropriate managers or staff.

Goal#4 Contribute to the efficient and sound management of the Office of the Scientific Director-General.

Activities / Outputs

4.1 Manage the executive correspondence system by:
- tracking and actioning incoming and outgoing mail;
- coordinating with program areas to obtain required input, compiling information for the Scientific Director-General's review / approval, and forwarding approved input to the ADM's correspondence coordinator;
- drafting responses to incoming information requests for the Scientific Director-General's review / approval; and
- ensuring all NML responses meet specified deadlines, have accurate coding, are filed appropriately.

4.2 Manage the office's work processes and procedures by creating and updating standard operating procedures for each position within the Office of the Scientific Director-General.

4.3 Ensure the office is equipped with appropriate supplies and tools to run in an efficient and professional manner.

4.4 Track the committees and memberships of NML managers and staff by:
- regularly updating the committees / memberships binder of the Scientific Director-General; and
- liaising with university and other government and non-government departments to ensure committee and membership lists are up to date and transparent.

SCIENTIFIC DIRECTOR GENERAL'S OFFICE - Budgets and Staffing

Salary Funding

Annualized Salaries:	$554K	
Approved FTEs:	4	
Vacant Approved Positions:	1	(as at June 30, 2014)

O&M Funding

Allocated Notional O&M:	$30K

Office of the Executive Director

The Office of the Executive Director (OED) plays a key role in the leadership of NML. As delegated by the Scientific Director General, Executive Director, Steven Guercio, leads the day-to-day operational and administrative functions and provides strategic input, policy advice, and management oversight for all lab activities.

In primary support of the NML objective of *Program Support, Infrastructure Integrity and Management Oversight*, divisions reporting to OED work to provide a safe, secure and effective organizational and physical infrastructure. Programs reporting directly to OED include:

- ✓ Real Property Safety and Security Division
- ✓ Science Support and Client Services Division
- ✓ Program Services and Support
- ✓ Scientific Information Services
- ✓ Network and Resilience Development

Additionally, the Community Liaison Program and policy, planning and reporting functions operate within the auspices of the OED.

The Executive Director oversees NML's science and support programs by:

- ✓ overseeing the management and integration of NML operational activities within the Branch and Agency
- ✓ ensuring NML workforce capacity and diversity meet current and future needs through development and implementation of effective staff engagement, retention and succession planning initiatives and addressing labour relation issues
- ✓ overseeing the operational management of NML including administration, procurement and financial activities
- ✓ providing strategic direction for the provision of safe, efficient and effective program support services and infrastructure
- ✓ developing and administering strategies and activities to strengthen internal and external stakeholder relationships

Goal#1 Oversee the management and integration of NML operational activities within the Branch and Agency.

Activities / Outputs

1.1 Define and implement strategies to realize One Laboratory Management.
1.2 Contribute to the Agency's Science and Research Framework and the related input to the development of the Office of the Chief Science Officer.
1.3 Ensure NML meets internal and corporate planning and reporting obligations in an effective and organized manner.
1.4 Work with Branch counterparts to identify areas of common concern and seek opportunities to improve integration of activities.
1.5 Work with various Health Portfolio stakeholders to implement the organizational changes resulting from the Agency's Transformation Agenda.

Goal#2 Ensure NML workforce capacity and diversity meet current and future needs.

Activities / Outputs

2.1 Oversee staffing and succession planning throughout NML.
2.2 Manage human resources challenges and ensure NML organizational structure is optimized to maintain efficient and accountable lab operations.
2.3 Participate in labour relation activities, including regular union management interactions and effective resolution of specific cases.
2.4 Engage and communicate with staff through various fora.
2.5 Provide leadership in ensuring NML meets its obligations of the Performance Management Directive.
2.6 Implement 360 degree reviews for senior NML managers.

Goal#3 Oversee the operational management of NML, including administration, procurement and financial activities.

Activities / Outputs

3.1 Oversee NML budget allocations and expenditures, ensuring financial accountability through effective budgeting and reporting and monitoring.
3.2 Review travel requests in a timely, fair and equitable manner.
3.3 Work to integrate WCSC and NML budgets, in conjunction with Program Support and Services.

Goal#4 Promote NML engagement with partners and stakeholders.

Activities / Outputs

4.1 Represent NML within the Infectious Diseases Prevention and Control Branch (IDPCB) on the Branch Executive Committee.
4.2 Represent NML within the Public Health Agency of Canada as requested by the Scientific Director General
4.3 Ensure NML input is provided to national health networks though contributions to the Canadian Public Health Laboratory Network (CPHLN), the Pan-Canadian Public Health Network (PHN) and the Global Health Security Action Group (GHSAG).
4.4 Promote and facilitate NML-based projects and activities that enhance the Agency's and NML's reputation as an international leader in infectious diseases and benefit internal and external stakeholders, which include:
- quality systems accreditation;
- Laboratory Information Management System (LIMS); and

- internal and external training.

4.5 As directed by the Scientific Director General, represent NML on the Community Liaison Committee.

4.6 Participate in the CSCHAH Institutional Biosafety Committee in partnership with NCFAD

4.7 Conduct the NML Client Satisfaction and Needs Assessment Survey.

Goal#5 **Lead and provide strategic direction for the provision of safe, efficient and effective program support services and infrastructure.**

Activities / Outputs

5.1 Manage the transition of the J.C. Wilt lab facility, including the relocation of the NHRL program and the staffing of facility / business support positions.

5.2 Work with Health Portfolio Security to ensure that security initiatives, including NML's pathogen inventories, are implemented.

5.3 Oversee the adherence to the updated Departmental Security Policy and implementation of Security's recommendations in the lab's threat/risk assessment.

5.4 Work with various stakeholders to ensure NML's Long-term Capital Plan is updated and reflects Operations Centre, lab refits, lab equipment, and IT requirements.

5.5 Chair NML Accommodations Working Group that gathers space requirements and makes recommendations to the Scientific Director General for the allocation of space for NML staff at the CSCHAH, the 275 Portage headquarters and the J.C. Wilt Infectious Disease Centre.

5.6 Continue using NML Workplace Assessment as a guide for further workplace improvements.

Community Relations Services

The Community Relations area is led by Kelly Keith, Community Liaison Program Manager. It facilitates CSCHAH and NML internal communications, facility tours, facility orientation, outreach activities and the relationship with the community at large, including the Community Liaison Committee. Staff also provide briefing and policy support for NML. The unit coordinates their activities closely with Communications staff.

2014-15 Goals, Activities / Outputs

Goal#1 **Ensure that the community is kept informed and has a good understanding of the role and activities of the CSCHAH.** *(Program Support / Network Development)*

Activities / Outputs

1.1 Work with the Communications unit in preparing program or facility material for external audiences (e.g., NML / NCFAD / CSCHAH fact sheets, brochures, videos) as needed.

1.2 Seek opportunities to provide presentations to community residents / groups to increase their understanding of the facility and its programs and to foster confidence, pride and support for the Centre's work.

1.3 Provide administrative and communications support for the CSCHAH Community Liaison Committee (CLC).

1.4 Lead a committee to plan and coordinate a public open house in October 2014.

1.5 Explore the possibility of running a public seminar series at CSCHAH by March 31, 2015.

1.6 Work with RPSS, SES, Communications and CLC to review and update the Incident Reporting System and ensure the system is utilized appropriately by March 31, 2015.

1.7 Update the CSCHAH Community Relations Plan by March 31, 2015. Develop a more strategic and proactive approach for outreach events that focuses on consistent, considered and organized activities most beneficial to the Centre, based on resources available.

Goal#2 **Ensure that CSCHAH staff are knowledgeable about the facility and programs as well as informed of work and non-work related activities.** *(Program Support / Network Development)*

Activities / Outputs

2.1 Continue the enhancement of the CSCHAH facility orientation program, including the implementation of a welcome kit, for CSCHAH employees, students and contractors to help ensure awareness of their facility-related responsibilities and the services available to them.

2.2 Arrange, vet and conduct tours for new staff that illustrate the features of the CSCHAH, its construction and programs.

2.3 Prepare program and facility material for internal audiences (e.g. “This Week at NML”, “Inside the Box” newsletters, e-board notices, internal videos). Help promote awareness of events and issues through these means.

2.4 Support staff-related events at CSCHAH.

2.5 Work with other units to investigate the feasibility of a CSCHAH internal Intranet / Extranet site for facility-related information and communications.

2.6 Further develop the Ambassadors Program wherein CSCHAH staff representing the lab programs or facility to outside interests are equipped with appropriate material by March 31, 2015.

2.7 Prepare information/messages for distribution to staff by NML/CSCHAH senior management.

2.8 Prepare speaking notes for use by NML senior management.

Goal#3 **Ensure that visitors have a good understanding of the role of CSCHAH and NML.** *(Program Support / Network Development)*

Activities / Outputs

3.1 Vet, arrange, conduct and track tours that illustrate the features of the CSCHAH, its construction and programs. Coordinate agendas and room schedules for visits requiring meetings as well as tours, when required. Develop and provide presentation tailored to specific audiences.

Goal#4 **NML-related documents and briefing materials are well-prepared and informative.** *(Program Support)*

Activities / Outputs

4.1 Participate in the preparation of NML Business Plan and other documents as required.

4.2 Prepare and/or edit briefing notes, question period notes, speeches, slide decks and other materials relating to NML and CSCHAH.

4.3 Contribute to the management of policy issues by providing laboratory related support, conducting research, developing recommendations, preparing background materials, reviewing documents and report writing.

Goal#5 **Increase school outreach in order to encourage students to study the life sciences, reach parents/families via the students, and develop positive experiences related to the lab for these future taxpayers.**

Activities / Outputs

5.1 Seek opportunities to speak to science teachers/consultants during in-service conferences or through a presentation/mini-tour at CSCHAH by March 31, 2015.

5.2 Expand high school outreach to include five visits per school year.

5.3 Explore possibility of a one-day job-shadowing program for approximately 10 Grade 11 students with a keen interest in microbiology. Students would be required to compete through an essay contest by March 31, 2015.

5.4 Attend at least one career fair per school year in order to encourage students to pursue life sciences as well as increase awareness of the lab among young adults.

Office of the Executive Director - Budgets and Staffing

Salary Funding

Annualized Salaries:	$476K
Approved FTEs:	6
Vacant Approved Positions:	1 (as at June 30, 2014)

O&M Funding

Allocated Notional O&M:	$93K

NML Program Services and Support

NML Program Services and Support area, led by Manager Florence Lopuck, plays an important role in providing support to NML science programs. The area's core services include:

- ✓ staffing, salary management support and financial planning for NML and WCSC
- ✓ budgeting and reporting support
- ✓ contracting and procurement of NML and Canadian Safety and Security Program ('CSSP' previously CRTI) goods / services
- ✓ CSSP project management
- ✓ national / international travel coordination
- ✓ hospitality coordination
- ✓ training / event support

2014-15 Goals, Activities / Outputs

Goal#1 **Contribute to the sound financial management of NML and the Agency through effective planning activities.**

Activities / Outputs

1.1 Provide NML's Scientific Director-General, Executive Director and Program Directors / Chiefs with financial information and advice on which to make sound decisions on salary and O&M resources which includes:

- updating business planning templates with prior years' actual and current year's notional budget information;

- assisting Program Directors / Chiefs in completing their salary and O&M requirements and related business cases;
- overseeing applicable funding streams and providing ongoing advice to Program Directors / Chiefs on expenditures that are within or outside of allocated budgets;
- reviewing, clarifying and advising the Scientific Director-General and Executive Director on proposed program spending; and
- making budget adjustments based on Branch or Directorate priorities and decisions to ensure expenditures are within allocations and communicate these changes to NML program managers.

1.2 Assist in efficient staffing processes within NML program areas by:
- assisting Program Directors / Chiefs to identify the most effective means of staffing and identifying opportunities for collaborative staffing actions;
- coordinating the staffing support activities (e.g., security and medical clearances);
- coordinating the NSERC program and hiring of students through the University of Manitoba;
- working as part of NML accommodations group to secure appropriate office or lab space; and
- maintaining NML organization charts and salary management information within SAP.

Goal#2 Contribute to the sound financial management of NML and the Agency through effective budgeting and reporting activities.

Activities / Outputs

2.1 Provide input into PHAC's Program Activity Architecture (PAA) and maintain NML's cost centres to accurately capture NML expenditures congruent with the PAA.

2.2 Assist NML program managers to effectively manage their allocated budgets by:
- reconciling SAP commitments with actual expenditures to ensure the accuracy of SAP financial information;
- providing timely, comprehensive variance reports to assist them in financial forecasting for their respective units;
- retrieving and analyzing management responses and compiling the information into NML financial situation reports;
- providing advice and guidance to senior NML and IDPC management concerning NML programs' ongoing financial situation; and
- tracking separately-funded initiatives through Special Purpose Accounts.

2.3 Manages tracking of separately-funded initiatives through Special Purpose Accounts.

Goal#3 Contribute to the sound financial management of NML and the Agency through effective procurement activities.

Activities / Outputs

3.1 On behalf of NML program areas, arrange or coordinate:
- short / long contracts for goods or services;
- procurement of supplies for NML science programs / administrative areas;
- short-term minor capital projects (e.g., lab refits); and
- call-ups for temporary help.

Goal#4 Enable the effective operational support within NML Program Areas.

Activities / Outputs

4.1 Lead the process to maintain and expand the use of NML Administrative Manual throughout NML administrative areas to:
- ensure consistent application of common core administrative processes throughout NML program and administrative areas; and
- facilitate the registration of NML Program Services and Support processes and procedures to the ISO 9001 quality standard.

4.2 Facilitate, provide guidance and coordinate:
- travel authorization and booking of domestic / international travel, accommodations, and related expenses;
- travel requiring IDPC Branch approval;
- travel and accommodations for people attending NML-sponsored events;
- hospitality authorization and payment; and
- training activities for NML staff.

Goal#5 Contribute to NML innovation and collaborations with other public health partners through CSSP initiatives.

Activities / Outputs

5.1 Solicit CSSP initiatives that are aligned with PHAC NML's mandate, current biological gaps and priorities.

5.2 Assist NML programs in preparing proposals and project charters to meet the criteria of the CSSP Secretariat.

5.3 Assist CSSP project leaders in:
- applying project management principles and maintaining projects plans, reports and other documentation to help ensure scope, timelines, and expenditure targets remain on track;
- assisting in the coordination of procurement activities for each project;
- facilitating information exchange between CSSP collaborators and other stakeholders and preparing applicable reports; and
- providing CSSP Secretariat services for the Biological Science Cluster on behalf of both NML and NCFAD.

5.4 Liaise with CSSP Secretariat on behalf of PHAC NML project leaders.

Goal#6 Effective business planning, risk management and sound financial comptrollership.

Activities / Outputs

6.1 Work with senior management to implement the financial planning and reporting integration of NML and WCSC Funds Centres.

6.2 Lead the preparation of budget forecasts for NML and WCSC cost centres, which includes:
- participating in the Agency's preparation of Agency Operational Planning and other planning / reporting templates;
- working with NML programs, RPSS Division and the IT group to ensure their financial requirements, including LTCP, are accurately consolidated as part of the budget forecasts;
- working with NML managers to develop a staffing plan for new and/or vacant positions at the new J.C. Wilt Infectious Disease Centre facility and an agreement to permanently reallocate the TB Submission budget to WCSC/NML;
- working with NML and Branch senior management to monitor NML / WCSC expenditures and commitments throughout the fiscal year and

make recommendations for adjustments to ensure overall projections remain on track;
- working with Human Resources and the Branch to ensure proposed staffing actions are well supported and processed in a timely manner; and
- working with the NCFAD to recover their 35% share of the Winnipeg Common Service Centre costs.

Goal#7 **Professional, reliable public-based services.**

Activities / Outputs

7.1 Provide professional, reliable reception and boardroom services and timely mail-delivery services to all CSCHAH staff by:
- maintaining a pool of qualified bilingual candidates to staff the receptionist and mail clerk positions;
- continuing work with the BASD group on requirements to modify the *FrontDesk* application to include modules for training, telephony and accommodations as well as formalizing procedures to update FrontDesk; and
- ensuring NML's information on the Government Employee Directory System (GEDS) is accurate.

Information Management

The Information Management Section, led by Florence Lopuck, plays an integral role in the overall business processes within the CSCHAH facility by providing information management services.

2014-15 Goals, Activities / Outputs

Goal#1 **Organized, accessible corporate information for client areas.**

Activities / Outputs

1.1 Maintain and grow the Information Management (IM) system for NML's science and business groups by:
- providing records classification, archival, and ATI (Access to Information) search support services as well as advice and guidance on information management guidelines and practices;
- continuing work with the scientific program areas to complete Business Analysis checklists;
- assisting the OC Manager and staff to help ensure activation- and non-activation-related documents are appropriately organized and accessible to users;
- preparing an implementation matrix for NML science and business areas to identify the level of IM participation / progress as well as a risk analysis of IM holdings;
- continuing to migrate records from the HIV lab in Ottawa and to provide the IM classification and business analysis thereof; and
- reviewing the PHAC IM Strategic Goals / Outcomes in the IM Framework document and MAF assessments to identify improvements that can be initiated locally.

1.2 Participate in the national RDIMS/GCDOCs initiative and lead the Winnipeg pilot group by:

- ensuring existing RDIMS users are appropriately supported with existing technology and training while the transition from RDIMS to Health Portfolio's *GCDOCS* initiative takes place;
- preparing a 2014-15 IM/RDIMS plan and training catalogue for all levels of users;
- preparing a proposal for senior management outlining the IM statuses and proposed mandatory training elements; and
- providing ongoing support to Business Operations sections to ensure RDIMS is the primary repository of corporate documentation.

Business and Information Services - Key Service Standards

- ✓ Documents classified from 1 to 4 working days for an existing office.
- ✓ New file requests actioned within 1 to 2 working days.
- ✓ File retrieval requests actioned within 1 working day.
- ✓ Archiving, Box Verification, actioned within 10 working days from the time the boxes are received.
- ✓ Application of retention schedules actioned within a month of the disposal date.

Program Services and Support - Budgets and Staffing

Salary Funding

Annualized Salaries:	$1.58M
Approved FTEs:	29
Vacant Approved Positions:	0 (as at June 30, 2014)

O&M Funding

Allocated Notional O&M:	$2.79M

Science Support and Client Services

Science Support and Client Services (SSCS), led on an acting rotational basis by Sharla Beddome, Garrett Sorenson, and Teresa Fleury, plays an integral role in the overall business processes and support of the scientific programs within the CSCHAH:

- ✓ the Director's Office provides overall management of SSCS groups to ensure timely business services to NML and NCFAD programs
- ✓ the Quality Office provides support and advice related to management system requirements for all groups within NML organization, coordinating the International Organization for Standardization (ISO) accreditation / registration for its laboratory and business functions.
- ✓ the Logistics and Materiel Services area provides shipping and receiving services for all goods and mail, maintains a stores operation for regularly consumable laboratory / office supplies, maintains life-cycle asset inventory control and provides moving, storage and asset disposal services
- ✓ the Operations Centre and Multimedia Services area provides audio-visual and telephony services throughout the facility, manages the state-of-the-art Emergency Operations Centre, maintains resources and protocols to enact the Incident Command System, prepares and maintains Business Continuity Plans, and organizes training, drills and exercises for emergency preparedness

- ✓ Laboratory Information Management System provides support and leadership for the development, implementation and maintenance of NML's Laboratory Information Management System (LIMS), used the management of samples from cradle to grave, tracking tests, results, related quality data, electronic approvals, the generation of results reports, worksheets, queries and summary reports, and tracking storage locations and inventories.The Biorepository program provides support for bio specimen management, provides curation services for invaluable scientific collections, and helps to ensure program areas meet and exceed regulatory and legal compliance related to bio specimen storage and management.

Director's Office – Science Support and Client Services

2014-15 Goals, Activities / Outputs

Goal#1 **Integrate Agency, CSCHAH, and NML strategic and business plan priorities (Program Support AND Leadership, Training, Network & Capacity Development)**

Activities / Outputs

1.1 Provide laboratory advice and feedback on behalf of NML for Agency/government initiatives that have direct or indirect laboratory implications.

1.2 Identify areas where SSCS programs can help align NML program areas to Agency/government priorities, strategic directions and initiatives by leveraging the diverse skill sets and cross-cutting support capacity of SSCS.

Goal#2 **Guide the effective provision of support and services to the NML programs (Program Support AND Leadership, Training, Network & Capacity Development)**

Activities / Outputs

2.1 Actively encourage feedback from the scientific programs for improvement and potential modifications to support functions of the division.

2.2 Resolve any issues related to the delivery of support to the programs areas.

2.3 Work with SSCS division mangers to implement solutions that can benefit the overall provision of services to NML program areas.

2.4 Champion SSCS services, support and related benefits to the greater NML ensuring that all program areas are aware of available services and potential program benefits.

2.5 Conduct the annual SSCS client survey, address the survey results with the Office of the Executive Director, implement actions plans to address identified deficiencies, and develop a Communication Plan directed to CSCHAH clients.

Goal#3 **Effectively manage SSCS program areas (Program Support)**

Activities / Outputs

3.1 Provide leadership and support required to ensure SSCS programs are able to deliver on their important mandates.

3.2 Oversee greater SSCS operations and working with SSCS managers to set priorities and future directions.

3.3 Promote cooperation between SSCS sections to leverage common strengths and help fill any functional or resource gaps.
3.4 Identify efficiencies between sections and highlight areas where sections can work together to better support greater NML program needs.

Goal#4 Support the PHAC 'One Lab' initiative (Program Support)

Activities / Outputs

4.1 Work closely with senior management to support the transition to 'One Lab' as needed
4.2 Help identify opportunities and efficiencies between NML and LFZ
4.3 Create feasibility proposals for the extension of SSCS services from NML to LFZ

Logistics and Materiel Management Services

The Logistics and Materiel Management Section, led by Luc Audette, plays a central role to all PHAC Winnipeg locations. The Section's core services include:

- ✓ providing shipping and receiving services for all goods and mail entering and leaving the CSCHAH and the J.C. Wilt Infectious Diseases Research Centre
- ✓ providing moving, storage, inventory control, and asset disposal services
- ✓ operating a Stores area that procures and maintains a stock of regular consumable laboratory and office supplies
- ✓ providing clients with procurement advice and guidance when purchasing laboratory or office equipment and supplies.

2014-15 Goals, Activities / Outputs

Goal#1 Dependable and cost-effective delivery and support of Logistics and Materiel Services to CFIA and NML clients (Program Support).

Activities / Outputs

1.1 Continue to provide input into the requirements for the Materiel Management functions at the J.C. Wilt Infectious Diseases Research Centre and adapt service levels to meet requirements.
1.2 Maintain the SOPs for the Logistics units and follow up on any conformity requirements identified during the ISO auditing process.
1.3 Work with the Application Support and Development group IT group to identify and/or implement any further enhancements to the *iShipIT* application such as mobile handheld device functionality.
1.4 Continue to provide support to the 275 Portage office for inventory control, surplusing and storage as outlined in the Letter of Agreement with the Corporate Administration and Services Directorate. Adapt to the ongoing changes, as the PHAC staff move from the 275 Portage offices to 391 York in September/October 2014
1.5 Ensure appropriate asset inventory processes, tracking and reporting processes are in place, which includes:
- contributing to the requirements for the Agency's Asset Management Network solution to ensure NML/WCSC requirements and reporting metrics are included;
- working with NML/PHAC/HC Asset Management teams to update last year's >$10K asset inventory; and
- working with NML/PHAC/HC Asset Management teams to prepare a plan for undertaking a physical inventory for assets <$10K; and

- participate in National Asset Management group and provide input into new procurement / goods receipt process

1.6 Provide subject matter expertise as the NML transitions to a larger bluk liquid nitrogen tank to meet the growing demands for NML and the J. C. Wilt Centre for Infectious Diseases.

1.7 Provide technical assistance to the J. C. Wilt Ottawa project team to facilitate transportation logistics for various types of lab equipment.

Goal#2 Timely, efficient procurement of best-value goods for NML clients (Program Support).

Activities / Outputs

2.1 Participate in governmental initiatives with PWGSC and other groups such as the Federal Laboratory Infrastructure Governance (FLIG) group to promote improvements in the procurement-related processes and systems.

2.2 Initiate and coordinate the preparation of the Standing Offer Agreements, Supply Arrangements or inclusion as Stores items as required.

2.3 Promote Stores as an efficient and economical value added service to all CSCHAH clients.

Goal#3 Safe, timely movement of all incoming / outgoing goods (Program Support).

Activities / Outputs

3.1 Continue to ensure the training of new staff in applicable Standard Operating Procedures and Transportation of Dangerous Goods legislation and regulations.

3.2 Ensure all L&MS staff have x-ray baggage handler and incendiary detection training.

3.3 Ensure service standards are met by all Logistics staff.

Goal#4 Emergency Preparedness and Outbreak Response capacity (Emergency Preparedness and Program Support).

Activities / Outputs

4.1 Support the MERT teams' logistics in their event-related deployments.

4.2 Support emergency preparedness and outbreak response activities through participation in the ICS during times of national public health emergencies to support NML activations.

4.3 Promote cross -training between the different L&MS units to increase capacity & redundancy.

4.4 Ensure all staff have entry level ICS and EOC training.

4.5 Ensure staff maintain up-to-date EOC-related training and participate in EOC activations and exercises.

Logistics & Materiel Management - Key Service Standards

- ✓ Twice-daily delivery of Stores orders, incoming goods and mail
- ✓ Incoming goods - processed within 1 working day
- ✓ Stores orders for in-stock items - actioned within 1 working day

Operations Centre and Multimedia Services

The Operations Centre and Multimedia Services Section, led by Teresa Fleury, provides for the day-to-day functioning of the CSCHAH's state-of-the-art Operations Centre (OC) and telephony / multimedia services throughout the facility and at JC Wilt Laboratory. The NML objectives to which this section contributes are: Emergency Preparedness and Outbreak Response; Leadership, Training, Network & Capacity Development; and Program Support, Infrastructure Integrity and Management Oversight by:

- ✓ planning, preparing for and responding to public health emergencies such as infectious disease outbreaks and pandemic events by providing site support coordinated through the Operations Centre to field units or NML laboratories through the use of the Incident Command System
- ✓ organizing and providing site support training and exercises to sufficient numbers of the NML staff to assist in the delivery of effective response to public health emergencies (domestic or international)
- ✓ maintaining resources and Standard Operating Procedures site support to move through the Activation Levels of the OC
- ✓ providing logistical support to NML mobilized individuals/teams
- ✓ organizing and providing Building Emergency Response training and exercises to sufficient numbers of NML and JC Wilt staff to respond or assist in facility emergencies
- ✓ providing management and safekeeping services for the Government of Canada's special passports for NML employees
- ✓ managing and maintaining secure, reliable, redundant communications in the Operations Centre and throughout the CSCHAH, 275 Portage Avenue and the JC Wilt Laboratory.
- ✓ providing video-conference bridging services to the Health Portfolio on a national level
- ✓ providing clients with technical expertise and multimedia services support
- ✓ assessing OC and boardroom telephony and multimedia requirements and provide planning and replacement of outdated/off-warranty equipment with the latest technologies

2014-15Goals, Activities / Outputs

Goal#1 **Ensure NML staff can respond to domestic or international public health emergencies by providing emergency preparedness and response leadership, training and exercises. (Leadership, Training, Network and Capacity Development AND Emergency Preparedness and Outbreak Response)**

Activities / Outputs

1.1 Coordinate training efforts that strengthen NML's response capacity, which includes:

- constantly updating NML OC Training and Development Plan, Emergency Management Program SOP and preparing a 2014-2015 Training and Exercise Plan that describes the various EM training components required by NML staff to fulfil roles within an activated OC. Actively participates on the HP Emergency Management Training and Exercise Committees by supplementing and rewriting the National course offerings.

1.2 Lead / participate in exercises or mobilizations with internal and external (to PHAC) emergency management partners, including distributing approved After Action Reports (AARs) to participants an d SDG/ED with

identification of cost and recommendations for improvement by ICS call-out personnel.

1.3 As subject matter experts in ICS and EOC and related EPR roles in the NML, actively participate in all levels of activation of the OC in a leadership capacity and provides advice and guidance to all ICS team members before, during and after activation.

1.4 Participate on emergency preparedness committees within the Health Portfolio and other Federal Departments / Agencies and attend emergency preparedness and response conferences to maintain / enhance expertise and gain a network of EM partners.

1.5 Stay current with emergency preparedness and response trends and investigate opportunities to enhance protocols, partnerships, equipment or overall service.

1.6 Maintain and update the ICS contact list.

1.7 Provide management and safekeeping services for the Government of Canada's special passports for the ML (including JC Wilt) employees.

1.8 Manage and maintain secure, reliable, redundant communications in the OC and throughout the CSCHAH, the Kensington Building and the JC Wilt Infectious Disease Laboratory.

Goal#2 Ensure CSCHAH and JC Wilt staff can respond to internal, building-based incidents by providing BCP and Building Emergency Response Teams (BERT) related training and exercises. (Program Support AND Leadership, Training, Network and Capacity Development)

Activities / Outputs

2.1. Undertake the responsibilities of NML's Business Continuity Plan Coordinator. Address the observations from the Table-top and functional exercises held at CSCHAH.

2.2. Continue to work with RPSSD to support the training requirements and exercises for BERT.

2.3. Provide exercise design training to BERT/RPSSD partners and use the exercises they design to test emergency protocols within the CSCHAH

2.4. As subject matter experts in ICS and EOC and related EPR roles in the NML, actively participate in all levels of activations of BERT in a leadership capacity and provide advice and guidance to all ICS team members before, during and after activation.

2.5. Work with other Emergency Preparedness partners (e.g. Winnipeg Fire/Paramedic/Hazmat and Police) to promote and cultivate an awareness and interest in the CSCHAH and the emergency plans in place at this facility.

2.6. Work with other Emergency Preparedness partners to promote and cultivate an awareness and interest in Emergency Preparedness activities and events, such as Emergency Preparedness Week (e.g. Red Cross, Canadian Mennonite Disaster Recovery).

Goal#3 Provide dependable, cost-effective telephony services. (Program Support AND Network Development)

Activities / Outputs

3.1 Maintain and enhance the CSCHAH's telephony systems by:

- ensuring tele-conferencing equipment in all client locations is operational and easy to use;
- ensuring certified / trained telephony experts are available for timely on-site support;

- working with PWGSC and the necessary IT groups to ensure quality telephony services are maintained throughout the Shared Services Canada network standardization initiative;
- managing the OMNI secure voice and secure data equipment at NML;
- managing the CSCHAH's ongoing telephony requests (moves, adds, changes) in the most cost effective and timely manner
- regularly connecting / bridging via tele/video conference with Health Portfolio and business partners to ensure reliable connectivity; and
- maintaining the fleet of ICS Blackberries used by the ICS team during activations and by the 24/7 OCD.

3.2 Undertake projects on behalf of NML and/or PHAC clients to maintain or improve telephony services, which includes:

- working with the J.C. Wilt Infectious Disease Centre project manager, PWGSC, SSC, the necessary IT groups and others to ensure seamless telephony services at the J.C. Wilt Infectious Disease Centre, specifically replace loaner equipment this fiscal year with the switches procured through SSC.
- working with RPSSD, IT and SSC to identify the requirements for completing the migration of the Mitel digital telephone system to converged IP network VoIP technology.
- staying current with technological trends and investigating opportunities to enhance telephony or multimedia equipment to better serve clients by:
  - attending technological conferences and subscribe to trade publications; and
  - identifying and arranging appropriate technical training.

Goal#4 Provide accessible, timely multimedia services. (Leaderhip AND Program Support AND Network Capacity Development AND Training)

Activities / Outputs

4.1 Provide Multimedia Help Desk service to clients; provide technical support, troubleshooting and coaching on an ongoing basis.

4.2 Undertake various projects on behalf of NML and/or PHAC clients to maintain and improve audio-visual and other multimedia services throughout the facility.

4.3 Enhance/develop client independence by providing training sessions and how-to manuals on boardroom equipment.

4.4 Provide video conferencing bridge services to HP and external stakeholders on an ongoing basis

4.5 Provide video conferencing bridge services for PHACtually Speaking and the NML Seminar Series weekly to HP and some external stakeholders.

4.6 Update and develop multimedia and telephony documentation to provide clear and complete instructions to clients.

Goal#5 Effectively manage Quality Management issues. (Program Support and Emergency Preparedness and Outbreak Response)

5.1 Maintain the SOPs for the OC and Multimedia Services group and follow up on any conformity requirements identified during ISO audits.

5.2 Utilize the Quality Management System as a basis for tracking / reporting, prioritizing and actions recommendations and preventative / corrective actions resulting from AARs following activations and exercises.

5.3 Address / implement the follow-up actions from past AARs:

Goal#6 **Effectively manage overall Operations Centre and Multimedia issues. (Leadership AND Program Support AND Emergency Preparedness)**

Activities / Outputs

6.1 Participate in confirming the OC role in supporting planned events vis-a-vis response (e.g., infectious disease outbreak) activations.

6.2 Maintain the OC equipment plan and incorporate the information into NML LTCP budget forecast, which includes outlining:

- key OC equipment inventory and its age, cost and other pertinent information;
- maintenance / replacement required to service and/or replace off-warranty and out-dated equipment with newer technology;
- visit the service contract requirements; and recommended projects for 2014-15 and 2015-16.

6.3 Work with CEPR and NML staff to outline the protocols of NML Mobile Lab Teams as part of future international mobilization of NML / PHAC staff and ensure processes / procedures and roles / responsibilities are aligned accordingly.

6.4 Initiate a new Standing Offer with the JIBC for the provision of training on new courses and the acquisition of In-house Instructor led training materials

6.5 Maintain the Operation Centre Director on-call schedule and ensure that NML maintains 24/7 readiness and response for emerging issues.

Operations Centre and Multimedia Services - Key Service Standards

- ✓ Operations Centre staffed and accessible during core business hours
- ✓ Activation call-outs completed within 10 minutes of notice during core hours
- ✓ New telephony requests - closed within 1 business day
- ✓ Urgent telephony maintenance - closed within 4 hours
- ✓ Multimedia assistance for scheduled meeting - closed before start of meeting
- ✓ Urgent multimedia assistance - provided on an "on call" basis (immediate response)
- ✓ Audio-visual, telephone and IT equipment tested bi-weekly by users

Quality Office

The NML Quality Office, led by Sharla Beddome, provides support and advice related to management system requirements for all groups within NML organization, coordinating the International Organization for Standardization (ISO) accreditation / registration for both laboratory and business functions. Staff also provide support to NML lab programs and CPHLN client labs with respect to reference service-related issues which include responsibilities for the activities of the external reference centres.

NML Quality Office is responsible for establishing, supporting and maintaining NML management systems which include:

- ✓ auditing the multiple NML management systems
- ✓ ensuring compliance with NML management system's approved procedures and policies
- ✓ training NML staff and external stakeholders in NML management system elements
- ✓ maintaining and tracking Management System documentation

- ✓ developing quality procedures to facilitate a culture of continuous improvement
- ✓ reviewing quality documents to ensure compliance within the LabWare Laboratory Information Management System (LIMS) Quality Module
- ✓ calibrating / verifying certain NML laboratory equipment, and coordinating calibration of other equipment with external calibration providers

Additionally, the Quality Office coordinates projects associated with cross-cutting issues at NML and provides NML representation in support of various public health initiatives and activities which include:

- ✓ maintenance of the NLM Guide to Services
- ✓ coordinating external laboratory training programs
- ✓ developing policies for reference service-related issues, such as the prioritization and phasing in/out of reference services and handling of emerging pathogens
- ✓ coordinating contractual agreements with external reference centres where specific microbiological reference services are not provided by NML

2014-15 Goals, Activities / Outputs

Goal#1 **Provide leadership and support to ensure NML activities are of high quality according to internationally recognized standards. (Program Support)**

Activities / Outputs

1.1 Maintain and expand ISO 17025 accredited tests and 9001 certified processes, including the addition of tests considered to be sensitive and/or high profile. This includes both laboratory sections currently participating and new laboratory sections in a future scope expansion assessment by the Standards Council of Canada (SCC). Laboratory sections still be included in the scope expansion are:
- Diagnostic Microscopy and Imaging
- Enterics and Enteroviruses
- Poxvirus

1.2 Coordinate the required biennial ISO 17025 assessment visit for all tests currently in scope.

1.3 Maintain and expand ISO 9001 registration for NML support services including specific processes within the Genomics section

1.4 Provide leadership regarding additional management System initiatives by:
- supporting the ISO 15189 accreditation for the NHRL; and
- providing advice and guidance to NML sections interested in incorporating requirements of ISO 17043 and
- supporting NML Biorepository Program's initiatives including GMP certification, ISO 9001 registration and policy/procedure development.
- providing guidance and support to the SES section in their pursuit of an occupational health and safety management system
- providing guidance and support to NML laboratories working within a GLP enviroment

Goal#2 **Provide leadership on quality system issues for external partners. (Leadership)**

Activities / Outputs

2.1 Provide advice and guidance on the implementation and improvement of quality systems to national and international partners.

2.2 As requested, conduct quality training courses to interested clients and stakeholders.

Goal#3 **Contribute to the continual improvement of NML activities. (Program Support)**

Activities/Outputs

3.1 Mitigate the risks associated with diagnostic testing by maintaining and improving the ISO 17025 quality system.

3.2 Increase the efficiency of quality activities.

3.3 Provide training on quality activities to NML personnel.

Goal#4 **Enhance the capacity of NML to provide high-quality reference services to client laboratories and stakeholders. (Leadership)**

Activities / Outputs

4.1 Coordinate the purchase of external reference standards and support the data analysis for anti-Rubella IgG and anti-HBs for CPHLN and hospital labs.

4.2 Maintain and update the NML Guide to Services and facilitate its future move onto the CNPHI network

4.3 Develop and maintain a database of available proficiency testing providers that can be used by clients for quality assurance purposes.

4.4 Assist in the requirements gathering and implementation of the E-reqs initiative at the NML.

4.5 Coordinate all future training/GLP activities in the Training/GLP laboratory at the JC Wilt Laboratory

Goal#5 **Contribute to policy development and reporting to ensure appropriate documentation of NML activities. (Program Support)**

Activities / Outputs

5.1 Provide advice and support to Senior Management regarding any relevant corrective and preventive actions and/or investigations.

5.2 Work with Senior Management on the development and improvement of NML over-arching policies and procedures.

5.3 Work with Senior Management on the development and improvement of NML over-arching policies and procedures.

5.4 Work with both applicable NML staff and clients to develop an MOU for sample-sharing

5.5 Influence NML performance measurement indicators, as compiled for the *Departmental Performance Report* by:

- increasing the number of NML sections and tests that are under ISO accreditation; and
- coordinating and compiling turn-around time data for in-scope tests.

Goal#6 **Oversee the funding, activities, evaluation and monitoring of External Reference Centres. (Leadership)**

Activities / Outputs

6.1 Coordinate funding for National Reference Centre for Parasitology (NRCP).

6.2 Support the efforts of the NRCP to develop and accredit a quality management system

Laboratory Information Management System (LIMS)

The mission of NML Laboratory Information Management System (LIMS) Team, led by Garrett Sorensen, is to provide an efficient and effective LIMS system for NML programs. The LIMS team is responsible for:

- ✓ working with NML programs to identify opportunities for LIMS to help improve processes, streamline workflow, comply with SOPs, policy and regulation and increase productivity in laboratory operation;
- ✓ developing, implementing, and supporting appropriate LIMS configurations allowing for the management of samples from cradle to grave, tracking tests, results, related quality data, electronic approvals, the generation of results reports, worksheets, queries and summary reports, and tracking storage locations and inventories;
- ✓ enabling NML programs to achieve and maintain accreditation to ISO 17025;
- ✓ supporting centralised sample inventory tracking for *Human Pathogens and Toxins Act* (HPTA) and related policy/legislation; and
- ✓ coordinating a cross-divisional team approach between NML and IM/IT.

LIMS is composed of two applications at NML - LabWare LIMS and IBM Cognos Business Intelligence. LabWare is a commercial software product that has been extensively customized and for both NML-wide and section-specific sample tracking requirements. Cognos is a robust reporting tool which provides reporting and querying capability. Cognos reports can range from simple, end-user driven queries to sophisticated reports summarizing a range of information across many sections or groups.

2014-15 Goals, Activities / Outputs

Goal #1 **Support of existing work flows and configurations (Program Support)**

Activities / Outputs

1.1 Addressing any new functional requirements and implement solutions as necessary (e.g., work flow changes, new reports, tests, etc).
1.2 Facilitate LIMS user meetings, information sessions and demos.
1.3 Provide training courses and associated system documentation.
1.4 Provide support for database queries, reports and line lists.
1.5 Provide support for sample imports/exports and interfaces between LabWare and other applications.
1.6 Track and prioritise all support activities to ensure issues/requests are resolved in a timely manner.
1.7 Liaise with NML Scientific Informatics Services to ensure the LIMS environment has:
- required patches/upgrades
- business critical failover systems are in place for data backup and retrieval

Goal #2 **Expande user base and scope of Laboratory Information Management System (Program Support)**

Activities / Outputs

2.1 Develop and implement appropriate LIMS workflows for diagnostic labs not fully implemented, including:
- National Laboratory for HIV Immunology
- Prion Laboratory Services

2.2 Offer solutions for unique scenarios where laboratory information needs to be managed.

2.3 Assess and develop migration strategies for legacy databases into LabWare LIMS.
2.4 Develop and implement Chemical Inventory Management and reporting functionality to monitor and track the location and quantity of chemicals, related MSDS sheets, and waste disposal.
2.5 Develop and implement Employee Training functionality to track and record staff training records.
2.6 Continue to roll out Sample Inventory Management and reporting functionality to allow labs to monitor and track the location and status of pathogens and other valuable biological materials being held in inventory by NML in order to meet the requirements of *Human Pathogen and Toxin Act* and related policy. This work is closely coordinated with the Boi-repository Manager, NML Inventory Control Steering Committee and Working Group.

Goal #3 Enhance LIMS functional capacity (Program Support)

Activities / Outputs

3.1 Continue the assessment of new modules offered by LabWare and implement as needed.
3.2 Improving the reporting functionality within LIMS to optimize preliminary reporting, final reporting, reprinting and reissuance of reports.
3.3 Optimize existing turnaround times calculation functionality to improve year end summaries.
3.4 Upgrade Cognos from version 8.2 to 10x.
3.5 Develop options for directly interfacing LIMS with lab instrumentation which go beyond existing file imports.
3.6 Develop a business plan to pilot radio frequency identification (RFID) tags on sample vials to streamline inventory checks, chain of custody transfers, and tracking the movement of vials in/out of storage locations.

Goal#4 In collaboration with CNPHI, develop and pilot an online requisition and reporting system (Program Support AND Leadership, Training and Network Capacity Development)

Activities / Outputs

4.1 Working with Quality Office, review NML programs existing requisition forms and move towards a standard electronic form.
4.2 Working closely with CNPHI, develop an option for client/partner laboratories to electronically submit sample requisitions and retrieve result reports.
4.3 Working closely with CNPHI, integrate LabWare LIMS and CNPHI as required.
4.4 Establish electronic signature capability for electronic reporting.
4.5 Collaborate with client/partner labs as required to find options for a more direct or automated interface between LIMS to eliminate manual data entry.

Goal#5 Coordinate a federal/provincial CPHLN LIMS working group and participate in national data standards initiative projects (Program Support AND Leadership, Training and Network Capacity Development)

Activities / Outputs

5.1 Investigate data standards such as SNOMED, pCLOCD, and LOINC and begin mapping these within NML LIMS as required.

5.2 Participate in the Canadian Health Infoway Standards Collaborative Working Group (SCWG) to evaluate current electronic standards and provide guidance where needed to laboratories at the NML.

5.3 In collaboration with client/partner provincial labs, facilitate a LIMS working group to:
- discuss common LIMS issues;
- work towards electronic test requisitioning and reporting;
- promote standards; and
- share expertise.

Goal#6 Migrate LIMS to the Science Network (Program Support)

Activities / Outputs

6.1 Activities / OutputsComplete the migration of the LIMS system to the science network to facilitate interfacing with CNPHI, BioNumerics and other applications.

6.2 Lead business requirements and lab assessments

6.3 Develop and lead user training business transition

Goal#7 Assist Laboratory for Foodborne Zoonoses in their LIMS implementation (Leadership, Training and Network Capacity Development AND Program Support)

Activities / Outputs

7.1 Collaborate with LFZ to provide assistance with business analysis and share best practices and lessons learned from NML implementation. This includes:
- mapping out key business practices and translating to work glow requirements; identify similarities in work flows; and
- working collaboratively with LFZ PHAC IT group to help implement where appropriate.

Goal#8 Continue to support and enhance the Bio-Numerics application (Program Support)

Activities / Outputs

8.1 Assess the NML's current licensing agreements for BioNumerics and recommend efficiencies

8.2 Facilitate the data exchange between BioNumerics and LIMS

8.3 Continue to expand the user base and scope of BioNumerics

Biorepository Program

The NML Biorepository Program, led by Louis Bryden, provides support for biospecimen management and has organised its activities into six main areas of competency:

- ✓ Support of NML's biological inventory management and security
- ✓ Curation of invaluable scientific collections
- ✓ Regulatory and legal compliance, information security, and intellectual property management
- ✓ Resource sharing
- ✓ Deposit services (General, Safe, Cell, cGMP, Patent, IP)
- ✓ Accredited quality management system

Each year, NML receives thousands of human and environmental specimens from partners and stakeholders in public health throughout Canada and abroad. Most specimens are archived because of their potential importance to public health and safety. The Biorepository Program houses a unique collection of specimens, critical to research in medicine and public health. The program provides the NML with the capacity to conduct important research and identify and detect newly emerging potential public health disease threats. The program provides an excellent resource with which to conduct research and support the emergency preparedness and response functions in support of the Agency's strategic priorities.

In cooperation with the Office of Intellectual Property Management & Business Development (Office of the Chief Science Officer), the program is taking a leadership role in the Agency's approach to collections management by establishing an infrastructure and governance model that will position NML relative to global biobank benchmarks. This infrastructure will support the Agency and the future of life science and biotechnology by providing services that conform to an accredited quality management system including ISO 9001:2008 and cGcP certification. NML will be compliant with industry regulations as well as meet OECD and ISBER best practices.

2014-15 Goals, Activities / Outputs

Goal#1 **Ensure the process of biological inventory management is applied NML-wide. (Program Support)**

Activities / Outputs

1.1 Provide leadership for NML's Biological Inventory Management project, by ensuring compliance with the *Human Pathogen and Toxin Act* and the Audit Services Division Report on Security of Laboratories (June, 2009), until implementation is complete.

1.2 Continue to work with RPSSD, LIMS support and PHAC science program areas to create, implement and maintain an NML-wide, secure, documented pathogen inventory tracking system.

1.3 Coordinate the development and implementation of policies and/or procedures for the provision of biological inventory management.

1.4 Train and coordinate the Biological Inventory Management Audit team.

1.5 Verify the NML inventory system by working with Biological Inventory Management representatives to perform inventory audits.

Goal#2 **Establish a biospecimen management system. (Program Support AND Leadership, Training, Network & Capacity Development)**

Activities / Outputs

2.1 Work with the NML Quality office to establish a quality management system to the ISO 9001:2008 quality standard and to provide QA/QC for specimens in the collection.

2.2 Coordinate regulated activities with the Office of Intellectual Property Management & Business Development.

2.3 Contribute to the formation of a PHAC BioBank Policy group and an advisory committee for collection admission and apportionment of space.

2.4 Establish a cGxP certified cold chain storage system to meet agency requirements for the regulated storage of pharmaceuticals, vaccines and valuable biological material.

2.5 Create a microbial DNA BioBank that meets ISO quality standards. This will allow participation with OECD member countries and facilitate biological resource sharing when the movement of microbial agents become problematic.

2.6 Provide curation of rare and irreplaceable scientific collections, historical collections, reference material, new and reclassified strains, deposits as

well as materials with associated legal, proprietary or intellectual property attributes and outbreak, pandemic or emergency samples.

Goal#3 Contribute to public health surveillance activities through collaborative partnerships. (Leadership, Training, Network & Capacity Development AND Program Support)

Activities / Outputs

3.1 Continue to provide support for the Canadian Health Measures Survey (Statistics Canada) by providing biorepository services and specimen processing.
3.2 Serve as a member of the CHMS BioBank Advisory Committee
3.3 Strive to work towards making biological collections compatible with the Organization of Economic Cooperation and Development (OECD) member countries by bringing up our collections to international quality standards.
3.4 Lead a working group that includes PHAC, the CPHLN and other agencies/departments to establish the Canadian National Culture Collections for pathogenic bacteria, viruses and cell lines.
3.5 Develop policy/guidelines on sample retention/ destruction/ transfer with all stakeholders.
3.6 Continue to provide support for the H1N1 ICU study.
3.7 Support the Laboratory of Foodborne Zoonoses HUS study.
3.8 Maintain collaborations with international partners such as GHSAG Laboratory Network and the CDC.

Goal#4 Continue to support and expand other Biorepository related initiatives including (Program Support):

Activities / Outputs

5.1 Support for the Laboratory Equipment Monitoring and Alarm System (LEMAS) at the NML and JC Wilt Facilty.
5.2 Establish an independent equipment monitoring system that meets ISO 9001, 17025, 15189 quality standards, cGxP regulations and 21 CFR Part 11 compliance within the biorepository and JC Wilt Facility. The system will provide real-time continuous data capture, Web Office server accessible reporting and direct emergency notifications.
5.3 Support science programs by reviewing new storage technologies for preservation of valuable biological materials and preparing to acquire the necessary equipment to provide freeze-drying services.
5.4 Provide co-managerial support in the establishment and operation of a centralized tissue culture facility and the CompactT automated cell culture system within the NML.
5.5 Continue to provide input into the requirements for the Material Management functions at the J.C. Wilt Infectious Disease Centre.
5.6 Collaborate with the LIMS group for the introduction of two dimensional (2D) and passive RFID specimen training technologies.

Science Support and Client Services - Budgets and Staffing

Salary Funding

Annualized Salaries:	$1.99M	
Approved FTEs:	31	
Vacant Approved Positions:	1	(as at June 30, 2013)

O&M Funding

Allocated Notional O&M:	$1.104M

NML Scientific Informatics Service

The Scientific Informatics Service (IT) areas, led by Director, Bob Conarroe, play an important supportive role in the delivery of NML programs at the

CSCHAH:

NML Programs	Reference and Diagnostic Services	Surveillance of Infectious Diseases	Applied and Discovery Research	Emergency Preparedness and Outbreak Response	Program Support, Infrastructure, Integrity and Management Oversight
IT Security Policy Services	Distributed Computing Services				
	Application / Database Services				
	Production and Operations Computing Services				
	Data Telecommunications Services				

- ✓ the **Director's Office** coordinates, controls, and deploys IT services and resources to enable NML programs to achieve their goals / objectives. An important part of the Director's job is to forge and maintain relationships with important partners in IT Service Delivery – Shared Services Canada and the Health Portfolio Shared IT Services group.
- ✓ the **Distributed Computing Services group** (Client IT Services) provides user support for IT-related requests and problems; installation and configuration of end-point devices and software.

- ✓ the **Application / Database Services group** provides application development and support for NML business applications.
- ✓ the **Production and Operations Computing Services group** designs, implements, configures, installs and provides operational support and maintenance for PHAC IDPCB data centre services employed by the NML which consists of three separate and distinct computer environments: corporate computing, science network, and the BioInformatics high-performance compute cluster.
- ✓ the **Data Telecommunications Services area** provides front-line support for the NML networking infrastructure including cable plant, network switches and routers. It is the primary contact for secure data transfer requirements both domestically and internationally and is responsible for the science computing Internet and CANARIE connections.
- ✓ the **IT Security Policy Services group** provides ongoing IT Security information and advice to safeguard PHAC's electronic information; conducts IT forensics investigations; manages Security Assessment and Authorization (SA&A) Processes on application and infranstructure to ensure compliance with central agency policies and standards.

Distributed Computing Services, Production and Operations Computing Services, and Data Telecommunications Services

The Distributed Computing Services, Production and Operations Computing Services, and Data Telecommunications Services areas, led by Harvey Ulrich, are responsible for:

- ✓ National Service Desk - resolving user requests submitted to the National Service Desk
- ✓ Desktop Management Services - installation, configuration, operational support and maintenance of computers, printers, peripherals, and software
- ✓ Backup and Restore Services - delivers an information-centric, flexible and managed backup and **restore service to reduce the risk of data loss**
- ✓ **Data Centre Modernization Services - reduces data centre costs, reduce infrastructure complexity** and increase flexibility through consolidation, automation and virtualization
- ✓ Application Hosting Services - provides the infrastructure, application and data centre expertise to support client applications and assists programs in meeting business, audit and regulatory needs, controlling costs and simplifying application or server upgrades
- ✓ Server Management Services - provides PHAC Winnipeg employees a secure, reliable, flexible and optimized server environment to meet the data and application hosting requirements
- ✓ Storage Management Services - provides scalable, performance-based storage to meet server / application storage needs in a storage area network environment
- ✓ Web Hosting Services - from simple Web hosting to management of the PHAC intranet, maintains the integrity of Web environment in a manner that improves flexibility and scalability, increases responsiveness, reduces costs and risks, and enhances the clients' experience
- ✓ Carrier Management Services - provides the expertise needed to obtain and manage the required Internet services

- ✓ Network Management Services - maintains and refreshes network environments to ensure they meet high-performance program requirements
- ✓ Network Security Services - provides the IT security services to mitigate the many and varied threats, which includes a managed firewall, managed remote access, network admission control, network intrusion detection / prevention, managed proxy / caching / filtering, web content filtering, and network infrastructure monitoring
- ✓ Identity and Access Management Services - provides identity management to establish digital identities, verify individuals as authorized and control what they can use and what they can do

2014-15 Goals, Activities / Outputs

Goal#1 Ensure IT services are reliable and secure

Activities / Outputs

1.1 Operational support and maintenance of IT infrastructure and client end-point devices
1.2 Response and resolution of IT incidents and problems
1.3 Adhere to HC/PHAC IT Shared Services and SSC processes and procedures – examples procurement, change management

Goal#2 Provide IT service offerings and service levels in line with business requirements

Activities / Outputs

2.1 Work closely with our IT Service partners [HC / PHAC IT Shared Services and SSC] in defining business requirements and requesting appropriate service levels
2.2 Action National Service Desk open calls in a professional and timely manner

Goal#3 Maintain the security [confidentiality, integrity, availability] of information and computing infrastructure

Activities / Outputs

3.1 Understand and apply HC/PHAC and SSC IT security policies, standards and guidelines
3.2 Provide network perimeter security services
3.3 Daily IT monitoring and escalation of items of concern
3.4 End-point security for Science Network and BioInformatics high-compute cluster

Goal#4 Provide IT agility in responding to changing business needs

Activities / Outputs

4.1 Ensure NML OC activation IT requirements can be satisfied by working with the Health Portfolio Operations Centre on the 'Operating Protocol' used during activations
4.2 Create and execute an NML IT Roadmap and corresponding NML IT Procurement Plan

Goal#5 Provide transparency and understanding of IT Service Offerings and costs

Activities / Outputs

5.1 Create an IT Service Catalogue {LFZ and NML]
5.2 Improve IT financial management to capture costs against IT Service Offerings

Goal#6 **Accomplish proper use of applications, information and technology solutions**

Activities / Outputs

6.1 Ensure the successful rollout of Windows 7 and MS Office 2010 including rationalization of application requirements

6.2 Facilitate the migration of user email from Lotus Notes to MS Outlook

6.3 Provide advisory services to clients pertaining to the migration of old applications / systems to new software

Application / Database Services

The Application / Database Services group, led by Ayesha Khan, is responsible for:

- ✓ Laboratory Information Management System (LIMS) application configuration and support, database management, monitoring and support, deployment of adaptations and enhancements to LIMS, and testing changes to the LIMS environment to ensure readiness for production.
- ✓ Operational support and maintenance of NML business applications, examples BioNumerics (used by Pulsenet), iShipIT

2014-15 Goals, Activities / Outputs

Goal#1 **Provide application and database support to NML and LFZ laboratories for the PHAC Laboratory Information Management Systems (LIMS) in close collaboration with the LIMS team of Business Analysts led by Garrett Sorensen.**

Goal#2 **Provide operational support for a number of NML business applications such as Bionumerics and iShipIT.**

Goal#3 **Improve LabWare workflow and reporting functionality to facilitate electronic signatures and electronic reporting of laboratory results to external clients.**

Goal#4 **Incorporate National HIV and Retrovirology (NHLR) laboratory workflows (currently in Ottawa) into NML LabWare LIMS.**

Goal#5 **Move PHAC Laboratories LabWare LIMS hosting to the NML's Science Network.**

Goal#6 **Incorporate enhancements requested by NML laboratories into LabWare LIMS.**

IT Security Policy Services

The IT Security Policy Services group, led by Marites Gerra, is responsible for:

- ✓ Security Awareness - Providing presentations and information to PHAC Laboratories management and employees regarding IT Security policies, procedures, directives, guidelines and initiatives consistent with those of Health Canada and Agency IT Security and Government of Canada Central Agencies
- ✓ Information Security Services - Safeguarding NML information through the creation and implementation of IT Security policies, processes and technologies

- ✓ Risk Management Services - Providing advice to PHAC Laboratories management and work units on security requirements for applications and information holdings through Threat Risk Assessments (TRAs) or Security Assessment and Authorization (SA&A)

Business Continuity Services - Support the Business Continuity Program to ensure that Critical Services are available with minimum disruptions

NML Scientific Informatics Service - Budgets and Staffing

Salary Funding

Annualized Salaries:	$2.49M	
Approved FTEs:	35	
Vacant Approved Positions:	0	(as at June 30, 2013)

O&M Funding

Allocated Notional O&M:	$912K

Office of Networks and Resilience Development

The development of strong and resilient organizations is based on the forging of strong relationships, such as those created in active networks, and on the clear understanding of what institutions and their members hold as their aims and objectives. The Director of Networks and Resilience Development, Dr. Theodore Kuschak, is responsible for coordination of NML's international collaboration and for national and international networking development and activities.

In direct support of the NML core function of *Leadership, Training, Network and Capacity Development*, the Office strives to demonstrate scientific leadership at national and international levels; develop effective networks and relationships with key stakeholders; and support surge capacity through the strategic provision of scientific and technical expertise to deliver an effective national public health response.

The Office serves to support work around three of PHAC's infectious disease related corporate risks: Emerging and re-emerging infectious respiratory diseases, food-borne infectious diseases, and emerging and re-emerging vector-borne zoonotic infectious diseases.

This Office leads the Global Health Security Action Group (GHSAG) Laboratory Network Secretariat, supporting the Global Health Security Initiative (GHSI) initiatives of Canada, France, Germany, Italy, Japan, Mexico, the UK, the USA,, as well as the European Commission and the WHO.

This office also leads the Canadian Public Health Laboratory Network (CPHLN), a national forum of federal and provincial public health laboratories. The Office also contributes expertise and facilitates in laboratory network development on the North American continent through collaboration with CPHLN, the Association of Public Health Laboratories in the USA, and with *la Red Laboratorios Estatades de Salud Publica de México (RLESP) in* Mexico. In Canada, this office represents NML and PHAC in the development of a Farm-to-Fork Network of Laboratory Networks, to create laboratory networks and to strengthen linkages and agreements among public health, animal health, and food safety laboratory networks in Canada.

This office contributes to the mapping of public health laboratory networks. Mapping public health laboratories is an important part of understanding laboratory networks, their relationships and activities, and the diagnostic capabilities of those laboratories. The mapping of laboratories and their networks can be done using the NML product GLaDMap developed by NML's CNPHI Team. For more information about GLaDMap and networks that have been mapped, please visit www.globallaboratorydirectory.org

The overarching objectives of this Office are to:

- ✓ Lead the work of the Global Health Security Action Group (GHSAG) Laboratory Network and support the work of the Global Health Security Initiative (GHSI)
- ✓ Manage the activities and advancement of the Canadian Public Health Laboratory Network (CPHLN)
- ✓ Support the development of the Food Safety Integrated Surveillance Network (FSISN) and the Network of Laboratory Networks
- ✓ Support Cross-Border Laboratory Networking Activities in Canada, United States and Mexico
  Support the mapping of laboratories and their networks in Canada and abroad using GLaDMap

2014-15 Goals, Activities / Outputs

Goal#1 **Lead the work of the Global Health Security Action Group (GHSAG) Laboratory Network and support the work of the Global Health Security Initiative (GHSI)**

Activities / Outputs

1.1 Lead the GHSAG Laboratory Network Secretariat and manage its daily activities
1.2 Support the work of the GHSI and its working and tasks groups, and secretariat
1.3 Support planning work for workshops, exercises of the Laboratory Network and its participants and hosts, when requested
1.4 Coordinate and support any projects that are led by the Laboratory Network
1.5 Work to lever exercise and workshop opportunities for the Laboratory Network

Goal#2 **Manage the activities and advancement of the Canadian Public Health Laboratory Network (CPHLN)**

Activities / Outputs

2.1 Manage the CPHLN secretariat and oversee the activities of the CPHLN
2.2 Oversee and manage the restructuring of CPHLN's governance, decision-making processes and reporting structures
2.3 Ensure timely network response to emergent public health events
2.4 Improve CPHLN visibility and recognisability through use of appropriate media and through attendance at national and international conferences
Ensure productivity of CPHLN secretariat

Goal#3 **Support the development of the Food Safety Information Network (FSIN) and the Network of Laboratory Networks**

Activities / Outputs

3.1 Continue to support the CFIA as PHAC's co-chair in the development of the FSIN and the Network of Laboratory Networks
3.2 Work with CFIA-led secretariat to ensure CPHLN support to the development of the laboratory networks

Goal#4 **Support Cross-Border Laboratory Networking Activities in Canada, United States and Mexico**

Activities / Outputs

4.1 Support the development of an Alliance of North American Network of Public Health Laboratory Networks (ANAPHLN).

4.2 Support the continued activities of Beyond the Border (BTB) initiative led be Public Safety Canada and the US Department of Health and Human Services

4.3 Support the continued activities of North American Plan for Avian and Pandemic Influenza (NAPAPI) lead by Public Safety Canada , the US Department of Health and Human Services, and Salud in Mexico

Goal#5 **Map laboratories and their networks in Canada and abroad using GLaDMap.**

Activities / Outputs

5.1 Work with GLaD development team to map laboratories and laboratory networks in Canada and abroad using the GLaDMap tool.

Canadian Public Health Laboratory Network

The Canadian Public Health Laboratory Network (CPHLN) is a national forum of federal and provincial public health laboratories, providing a unified federal / provincial response to naturally occurring infections and deliberately introduced bioterror-related agents. Within NML's role as the CPHLN Secretariat, Manager, Dr. Theodore Kuschak, leads the coordination and promotion of CPHLN:

- ✓ monitor CPHLN's Council Operations-led Activities
- ✓ preparation and implementation of Laboratory Instrumentation activities and other collaborative toolssupport, enhance and maintain Laboratory Preparedness activities
- ✓ support, enhance and maintain Laboratory Standards activities
- ✓ ensure effective CPHLN secretariat management of CPHLN operations
- ✓ support and foster national and international network partnerships

2014-15 Goals, Activities / Outputs

Goal#1 **Monitor CPHLN's Council Operations-Led Activities.**

Activities / Outputs

1.1 Monitor and continue to support the growth and development of the Canadian Laboratory Response Network

1.2 Monitor and continue to support the growth and development of the Reference Centre Advisory Subcommittee

1.3 Monitor and continue to support the growth and development of the Laboratory Liaison Technical Officer Program

Goal#2 **Preparation and implementation of Laboratory Instrumentation activities and other collaborative tools.**

Activities / Outputs

2.1 Revise and obtain signatures on the 2014 PulseNet MOU

2.2 Work with federal and provincial public health laboratories to implement next generation technologies such as genomics.

2.3 Work with federal and provincial public health laboratories to evaluate the feasibility of a virtual biorepository for Canada

Goal#3 **Support, enhance and maintain Laboratory Preparedness activities.**

Activities / Outputs

3.1 Work with federal and provincial public health laboratories to ensure laboratory response to emerging public health threats such as influenza

3.2 Work with federal and provincial public health laboratories to enhance laboratory biosafety and biosecurity regulation and legislation. Participate within the Laboratory Network for Food Safety (LNFS) to address the Weatherill report recommendations to establish a national network of networks, linking Public Health, Food and Animal Laboratories within Canada.

- CPHLN secretariat membership within Group #2 (Establish a Food Laboratory Network), in addition to providing secretariat support to Group #5 (Mobilize Capability and Capacity).
- CPHLN members participate upon the working groups within the LNFS to provide technical expertise.

Goal#4 **Continue to enhance Laboratory Standards activities.**

Activities / Outputs

4.1 Assess the feasibility of developing national environmental water testing standards.

4.2 Improve procedures and knowledge for shipping and receiving of samples

4.3 Work with federal and provincial public health laboratories to publish Syphilis diagnostics standards

4.4 Work with federal and provincial public health laboratories to enhance Lyme Disease standards

Goal#5 **Ensure effective CPHLN secretariat management of CPHLN operations.**

Activities / Outputs

5.1 Laboratory Preparedness and Response

5.2 Network Outbreak Response

5.3 CPHLN Member Requests and Approvals

5.4 CPHLN Annual Meetings

5.5 Strategic Planning

5.6 PHAC/PHN Liaising

5.7 Ensure the timely revision and uptake of NNDs as they apply to public health laboratories

5.8 Marketing of the CPHLN

Goal#6 **Support and foster national and international network partnerships.**

Activities / Outputs

6.1 CPHLN and the U.S. Association of Public Health Laboratories (APHL) will continue to work cooperatively on areas of common interest

6.2 As part of the US-Canada “Beyond the Borders Initiative for Laboratories,: undertake a comprehensive mapping of cross-border activities between existing laboratory networks, both at national and regional levels, to identify potential gaps in collaboration and to leverage existing mechanisms for further cross-border work. Although this has been marked as completed CPHLN and APHL have identified it as an ongoing task.

6.3 CPHLN will work to support the laboratory objectives outlined in the North American Plan for Animal and Pandemic Influenza Project improve international connectivity among the three countries (Canada, USA and

Mexico). These include an MOU between the laboratory networks, communications protocols, and capability and contact information.

6.4 Provide advice and membership to cross-border state / provincial groups (e.g., Pacific Northwest, Great Lakes Border Health Initiative, etc.).

Canadian Public Health Laboratory Network - Budgets and Staffing

Salary Funding

Annualized Salaries:	$316K	
Approved FTEs:	4	
Vacant Approved Positions:	0	(as at June 30, 2014)

O&M Funding

Allocated Notional O&M:	$85K

Real Property, Safety and Security

The Real Property, Safety and Security Division (RPSSD), led by Director, Todd Coulter, provides an integral role in the overall operation of the facility.

- ✓ the Director's Office provides overall direction and management of the Real Property, Safety and Security Division and integrates the delivery of RPSSD services with PHAC's and CFIA's corporate strategy
- ✓ the Technical Services unit ensures optimal function and reliability of building systems, and plans, designs, carries out alterations and client refits and accommodation projects to support the Centre's programs and research
- ✓ the Safety and Environmental Services unit maintains a safe, progressive and effective work environment and supports NML and NCFAD programs through certification of all containment laboratories as well as advancing and promoting the science of biosafety, biocontainment and biosecurity
- ✓ the Containment Services unit provides decontamination and certification of all HEPA filters, certification of Biosafety Cabinets and Chemical Fumehoods, provides decontaminations of animal cubicles, and supports the program in investigating new and alternative decontamination technologies
- ✓ the Controls and HVAC System unit operates and manages the building's automation control system to provide directional air flow and maintains the security access control and video monitoring systems to provide fail-safe laboratory containment operations
- ✓ the Energy Centre unit operates the Centre's life-safety support systems and central heating and cooling plants to ensure optimum environmental conditions exist to provide uninterrupted containment and safe laboratory operation
- ✓ the Property Services unit supports the overall management of the RPSSD through budgetary management, reporting and cost recovery; life-cycle contracting administration and management; RPSSD specialized building systems support; building service contract management and administration; and RPSSD staff support services including secretarial services and RPSSD records management services
- ✓ the Quality Systems unit maintains ISO 9001-2008 certification of the Rendering and Bio-waste System, supports project management activities, manages the

helpdesk, and manages the computerized maintenance management system, with a drive towards continued improvement

The RPSS Division's vision is to be a world-class organization dedicated to the provision of excellence in Real Property and Asset Management services to PHAC and the CSCHAH programs. The divisional mission is to support the delivery of programs at the CSCHAH through the appropriate level of strategic and operational management of resources and physical assets to provide a safe, secure, productive and environmentally responsible work environment for PHAC and CFIA staff located at the CSCHAH.

Real Property, Safety and Security Division services are provided to both NML and NCFAD clients and are part of the overall 65/35 cost-share agreement for common services within the facility.

The RPSSD team ensures a safe, secure, productive work environment for all CSCHAH personnel, enabling scientific staff and the Agency to achieve their strategic outcomes by:

- ✓ providing a fail-safe laboratory operation
- ✓ managing and responding to emergency situations
- ✓ carrying out daily building operations and preventative and predictive maintenance programs
- ✓ managing base-building projects, building system upgrades and modifications, refits and alterations
- ✓ undertaking and managing long term capital planning and capital projects to maintain asset value and integrity
- ✓ overseeing, coordinating and implementing client refit, alterations and accommodations projects
- ✓ ensuring operational compliance with Treasury Board and departmental policy standards (e.g., Government Security Policy (GSP), building codes, air quality codes, Canada Labour Code)
- ✓ initiating and managing ongoing technical and non-technical contracted services
- ✓ invest in energy reduction and sustainable development strategies in an effort to reduce the facilities environmental footprint
- ✓ providing a comprehensive safety training program to CSCHAH and external/international partners
- ✓ providing advice and counsel on environmental, biosafety, chemical, and occupational health and safety issues for the CSCHAH
- ✓ developing and instructing on bio-safety, bio-containment and bio-security, and bio-risk standards for the CSCHAH

Office of the Director - Real Property, Safety and Security

2014-15 Goals, Activities / Outputs

Goal#1 **Delivery of RPSS services within PHAC/NML and CFIA/NCFAD strategic and business priorities.**

Activities / Outputs

1.1 Oversee the provision of fail-safe laboratory operations by the effective delivery of facility, security, safety, environmental, and bio-safety services, laboratory and equipment re-certification and decontamination of CL-2, CL-3, and CL-4 laboratories.

1.2 Oversee laboratory certification programs for NML and NCFAD program areas.

1.3 Provide leadership for delivery of daily facility operations.

1.4 Oversee the cost-effective management and delivery of capital planning and capital projects to protect, enhance, and ensure the long-term viability of the assets.

1.5 Oversee the development and management of ongoing technical and non-technical contracts (multi-year, high-value standing offers and contracts) to supplement on-site resources and expertise.
NML

Goal#2 Effective delivery of client-requested projects.

Activities / Outputs

2.1 Oversee the delivery of client-requested projects in a cost-effective and efficient manner to minimize program disruption.

2.2 Contribute to accommodation planning activities that consider long term activities, cost effectiveness, and sustainable operations.

Goal#3 Effective management of RPSSD / CSCHAH issues.

Activities / Outputs

3.1 Define RPSSD management processes that will benefit from ISO 9001 registration.

3.2 Provide, as requested, technical support and input into development of the planning, building design and specifications for Agency activities.

3.3 Provide ongoing direction to the Rendering and Biowaste System quality management system.

Goal#4 Sustainable development initiatives aligned with the Agency's sustainable development strategy and environmental management.

Activities / Outputs

4.1 Manage the implementation of the CSCHAH Sustainable Development initiatives as part of the Agency's Sustainable Development Strategy and reporting on progress toward targets.

4.2 Provide leadership in the undertaking of sustainable development and environmental reviews and assessments of all projects developed and delivered by RPSSD.

4.3 Oversee environmental compliance and compile environmental reports as required.

Goal#5 Strengthened international CL-3 and CL-4 laboratory capacity.

Activities / Outputs

5.1 Participate in national and international peer-review panels.

5.2 Host delegations of international architects, engineers, and scientists interested in the construction and operation of a state-of-the-art high-containment facility.

5.3 Lead / participate in information exchanges to reciprocate technical and biosafety advice, best practices and experience on lessons learned.

5.4 Provide co-directors and instructors for various conferences and workshops including the Annual International High Containment Biosafety and O&M Workshops.

5.5 Provide facility-related technical assistance to other government departments / agencies when requested and available.

Technical Services

The Technical Services unit, led by Jeff Turnbull, is responsible for:

- ✓ ensuring the building's architectural, mechanical, electrical, plumbing and biological waste treatment systems are functioning at the optimum level through the day-to-day building operation, maintenance, and preventative maintenance
- ✓ providing project management, design, implementation and commissioning services for client, base-building and long-term capital projects

2014-15 Goals, Activities / Outputs

Goal#1 Fail-safe laboratory operating environment meeting NML and NCFAD mission-critical program mandates.

Activities / Outputs

1.1 Carry out a Preventative Maintenance program to enhance the capacity to monitor, maintain and service the facility's equipment and base-building systems.

1.2 Carry out proactive, planned, and timely maintenance to ensure building systems' optimal function and reliability, reduce equipment failure, reduce / avoid costs for remedial actions, and minimize program interruption.

1.3 Respond to and complete emergency maintenance on a priority basis.

1.4 Continue investing in the required staff, tools and training to maintain and enhance the quality management system for the Rendering and Biowaste System and the ISO 9001 registration.

1.5 Undertake training to maximize current technologies and identify opportunities for applying new technologies.

1.6 Acquire the appropriate tools and equipment to continually improve the level of service.

1.7 Maintain and expand the Predictive Maintenance Program that analyzes operational needs to determine the optimal point for capital asset repair, refurbishment or replacement.

1.8 Support RPSSD facilities and client-related activities through the use and management of the Computerized Maintenance Management System (CMMS) work order system.

1.9 Provide one-point-of-contact service for all occupants of the CSCHAH through the Facility Help Desk.

Goal#2 CSCHAH facilities and services adapted to meet the evolving needs of the Agency's priorities.

Activities / Outputs

2.1 Provide day-to-day repairs, modifications and upgrades to building system, laboratories and offices without compromise to the integrity of facility's life-safety systems and biocontainment capabilities while conforming to regulations, codes and standards.

Goal#3 Effectively managed projects for retrofits, renovations, alterations and client-funded refits.

Activities / Outputs

3.1 Ensure all projects comply with Treasury Board, departmental, and accepted industry policy standards (e.g., building codes, ASHRAE air quality codes, Canadian Laboratory Biosafety Guidelines, Canada Labour Code).

3.2 Provide project management of base-building projects, building system upgrades and modifications, refits and alterations without compromise to the integrity of the facility's life-safety systems and biocontainment capabilities while conforming to regulations, codes and standards. Projects include:
- Renderer Replacement;
- Autoclave Replacement;
- Upgrade Elevator Controls;
- Elgin Accessibility

Safety and Environmental Services

The Safety and Environmental Services (SES) unit, led by Catherine Robertson, is responsible for:

- ✓ maintaining a safe, progressive and effective work environment for all CSCHAH staff and the international community of high-containment laboratories
- ✓ improving program delivery pertaining to biological, chemical, radiological, and occupational health and safety-related topics
- ✓ supporting NML and NCFAD programs, by ensuring the timely certification of all containment laboratories
- ✓ promoting the science of bio-safety, bio-containment, biosecurity, and bio-risk

2014-15 Goals, Activities / Outputs

Goal#1 **Strengthened development, delivery and profile of the CSCHAH environment, health and safety programs.**

Activities / Outputs

1.1 Develop and deliver a competency based training program to ensure staff are provided with the essential skills, knowledge and abilities required for working at all levels of containment

1.2 Manage the medical surveillance and occupational health program for all staff, students and visiting scientists.

Goal#2 **Safe operation of the Centre and its programs.**

Activities / Outputs

2.1 Ensure compliance with the *Human Pathogens and Toxins Act*, and the requirements of the U.S. Select Agent Program.

2.2 Maintain laboratory re-certifications for the CSCHAH's 15 science programs, as well as the BT response laboratory in Ottawa, the JCWilt Infectious Diseases Research Centre and the Mobile Emergency Response Truck.

2.3 Provide biosafety advise, consultation and representation to the Institutional Biosafety Committee, Animal Care Committee and Local and National Occupational Safety and Health committees.

2.4 Perform large scale decontaminations in conjunction with Containment Services.

2.5 Develop and audit a universal chemical inventory and waste management program.

2.6 Research and validation of novel "greener" large scale decontamination technologies.

Goal#3 **Maintenance and delivery of the national Emergency Response Assistance Plan (ERAP).**

Activities / Outputs

3.1 Train Provincial / Territorial ERAP teams in emergency response procedures.
3.2 Maintain a database of Provincial / Territorial ERAP team members.
3.3 Provide supplies and training material to all Provincial / Territorial teams.
3.4 Renew Provincial / Territorial ERAP participation agreements.

Goal #4 **Provide expertise and training to national and international health partners**

Activities / Outputs

4.1 Conduct the International High Containment Bio-safety and Bio-risk Management workshops in partnership with International Centre for Infectious Diseases (ICID)
4.2 In partnership with Special Pathogens formalize a Containment level 4 training program.4.3 Acting with Special Pathogens as a single window for international CL-4 training activities.
4.4 Adopting and modifying this CL-4 training to train national high containment inspectors
4.5 Provide expert advice and consultation to international partners on design and management of high containment laboratories.

Goal #5 **Successful Management of Bio-risk and promotion of the Bio-risk Management Standards**

Activities / Outputs

5.1 Continue activities to fully implement the CWA 15793-2008 International Biorisk Management Standard at the CSCHAH
5.2 Develop a risk management tool and participate in risk management assessments for biosafety/biosecurity and health and safety.
5.3 Adapting the risk management tool for use as a submission document for the International Biosafety Committee and Animal Care Committee to streamline submissions
5.4 Assist NCFAD with the establishment of FAO reference centre for Laboratory Biorisk Management.
5.5 Working on the transition of the CWA 15793:2008 Biorisk Management Standard into an ISO Technical Standard

Containment Services

The Containment Services unit, led by Stan Klassen, is responsible for:

- ✓ the annual decontamination and certification of all HEPA filters
- ✓ certification of Class I, II and III Biosafety Cabinets and Chemical Fumehoods
- ✓ formaldehyde decontaminations of CFIA animal cubicles
- ✓ investigating new and upcoming alternative decontamination technologies
- ✓ providing related training to CSCHAH programs and external organizations

2014-15 Goals, Activities / Outputs

Goal#1 Safe operation of the CSCHAH Containment Laboratories.

Activities / Outputs

1.1 Perform annual testing and certification of HEPA filters, biosafety cabinets and chemical fumehoods as required by applicable guidelines / regulations and with minimum interruption to CSCHAH programs.

1.2 Perform maintenance, testing and minor repairs to CL-4 positive pressure suits, and notify programs when suits require extensive repairs by manufacturer.

1.3 Work with other programs to investigate new and upcoming alternative decontamination technologies which are safer and more environmentally friendly.

1.4 Begin integrating alternative decontamination methods (i.e., VHP, Chlorine dioxide, Dry Fog) into the regular decontamination activities.

1.5 Test and service other bio-containment equipment such as animal isolators, bedding change stations, clean benches, etc.

1.6 Extend services to the JC Wilt Infectious Diseases Research Centre and oversee contracted services for supplementing resource shorages

Goal#2 Minimized down time for CL-3 programs requiring gaseous room decontaminations.

Activities / Outputs

2.1 Enhance communications with programs to be aware of and anticipate decontamination requirements.

2.2 Provide scheduled formaldehyde decontamination services.

2.3 Provide technical support to programs to investigate alternate decontamination technologies such as Vaporized Hydrogen Peroxide and Chlorine Dioxide, and Dry Fog.

Goal#3 Ensure continued reliable, efficient operation of bio-safety cabinets.

Activities / Outputs

3.1 Begin a multi-year replacement program of dated and aging bio-safety cabinets at the CSCHAH by:

- identifying biosafety cabinets showing signs of wear and nearing the end of their life cycle; and
- determining which units are candidates for overhaul or replacement.

Goal#4 Support the activities of mobile laboratories.

Activities / Outputs

4.1 Provide technical support in the area of HEPA filter and on-board bio-safety cabinet testing for the CL-3 mobile truck lab and portable Mobicon lab.

Controls and HVAC System

The Controls and HVAC System area, led by Laura Douglas, is responsible for:

- ✓ managing, operating and improving the building's industrial instrumentation, building automation control system and ventilation delivery infrastructure which provides continuous fail-safe laboratory containment operations.
- ✓ providing project management, engineered design, implementation and commissioning services for client, base-building and long-term capital projects.

- ✓ maintaining, managing and improving the Security Access Control System and the Security and Client Video Monitoring Systems physical infrastructure and programming.
- ✓ support building application software, databases and infrastructure.
- ✓ supporting external activities related to instrumentation and controls on the CL-3 mobile truck lab and portable Mobicon units.

2014-15 Goals, Activities / Outputs

Goal#1 **A safe and secure environment through the effective management of the Building Automation System.**

Activities / Outputs

1.1 Ensure bio-containment by maintaining adequate directional airflow.
1.2 Ensure all software operations and control programs are routinely reviewed and updated to ensure fail-safe operation.
1.3 Maintain the integrity of the system and calibration repair / replacement of all points on a scheduled basis to ensure scientific staff have confidence in the facility's engineering controls.
1.4 Ensure repairs and maintenance are completed on schedule, without unplanned shutdowns that may affect laboratory containment or program delivery.
1.5 Maintain the calibration of critical measuring devices.
1.6 Maintain the laboratory equipment monitoring alarm system which
1.7 Maintain good operation of comfort controls.
1.8 Support JC Wilt maintenance team.

Goal#2 **A safe and secure environment through the effective management of the Security Access Control System and Video Monitoring System.**

Activities / Outputs

2.1 Ensure Biosecurity by disciplined approach in maintaining the security access control system.
2.2 Ensure all software operations and control programs are routinely reviewed and updated.
2.3 Maintain the integrity of the system and calibration repair / replacement of all system hardware on a scheduled basis to ensure CSCHAH occupants have confidence in the security controls of the facility.
2.4 Ensure all repairs and maintenance are completed on schedule without unplanned shutdowns that can affect the facility's security, laboratory containment or program delivery.
2.5 Investigate current technological trends and make recommendations for improved systems or processes to the Security Operations Manager.

Goal#3 **Effectively managed projects for retrofits, renovations, alterations and client-funded refits.**

Activities / Outputs

3.1 Ensure all projects comply with Treasury Board, departmental, and accepted industry policy standards (e.g., building codes, ASHRAE air quality codes, Canadian Laboratory Biosafety Guidelines, Canada Labour Code).
3.2 Provide project management of base-building projects, building system upgrades and modifications, refits and alterations without compromise to the integrity of the facility's life-safety systems and biocontainment capabilities while conforming to regulations, codes and standards.
3.3 2014-15 projects include;

- Progressing with a $5.3 Million multiyear project to replace the building automation controllers and field devices
- Critical environment cold room monitoring
- Building pressure reference improvements
- Isolation damper performance review and replacement
- CL-2 Heat Recovery System Feasibility Study
- Chemical Management and MSDS system software packages
- Incubator Controls retrofit

Energy Centre

The Energy Centre unit, led by Gerry Hunker, is responsible for:

- ✓ operating the Centre's central heating and cooling plants to ensure a comfortable environment for staff / visitors and an uninterrupted, safe laboratory operating environment
- ✓ carrying out the day-to-day operation, maintenance, and preventative maintenance of the steam, chilled water, process condenser, compressed air, and water systems

2014-15 Goals, Activities / Outputs

Goal#1 **Provide an uninterrupted laboratory operating environment to meet NML and NCFAD mission-critical program mandates.**

Activities / Outputs

1.1 Adhere to a preventative maintenance program and monitor, maintain, and service the facility's central heating and cooling plants.

1.2 Carry out proactive, planned, timely maintenance to ensure heating and cooling systems' optimal functioning and reliability, reduce equipment failure, reduce / avoid costs for remedial actions, and minimize program interruption.

1.3 Complete all maintenance within reasonable timeframes and respond on a timely basis to emergency issues.

1.4 Provide onsite monitoring and silent hours emergency response for critical building operating systems.

1.5 Provide project management for building system upgrades and modifications, refits and alterations without compromise to the integrity of facility's life-safety systems and biocontainment capabilities and in conformance with regulations, codes and standards. With the intent to improve upon building capacity, 2014-15 projects include:

- Continue investigation to install a new chiller unit to support recent and future expansion; and,
- initiate boiler burner replacement with a lower-emission type; and
- continue projects upgrading city water supply infrastructure.

Goal#2 **Optimize energy consumption within the Centre.**

Activities / Outputs

2.1 Monitor energy consumption and take appropriate actions to reduce peak loading.

2.2 Work in a continuous improvement mode, design and implement redundancy on several systems (process cooling, chilled water, steam system) with energy / cost savings as a by-product.

Property Services

The Property Services unit, led by Joyce Yuel, supports the overall management of the RPSS Division through:

- ✓ financial planning
- ✓ budgetary management, reporting and cost recovery
- ✓ staffing and salary management support
- ✓ life-cycle contracting administration and management
- ✓ RPSSD specialized building systems support
- ✓ administration and support services
- ✓ facility service contract management and administration
- ✓ RPSSD staff support services and RPSSD records management services

2014-15 Goals, Activities / Outputs

Goal#1 **Contribute to effective financial management of RPSS division as part of the NML and the Agency's overall financial comptrollership.**

Activities / Outputs

1.1 Provide information and advice to RPSSD Managers in managing their allocated budgets including;

- providing advice and guidance in determining their financial requirements and the unit's ongoing financial situation throughout the year;
- providing timely comprehensive variance reports to assist them in financial forecasting

1.2 Update and consolidate business plan financial projections for RPSSD.

1.3 Provide effective budgeting and reporting activities by:

- preparing the RPSSD financial situation reports monthly;
- requesting budget adjustments based on Branch or Directorate priorities and decisions
- the ongoing reconciliation of SAP expenditures and commitments including salaries, to ensure the accuracy of SAP financial information;
- maintain O&M and capital project spreadsheets with up to date information on progress, risks of not completing as scheduled, updating financial information based on expenditures/commitments and managers input.

1.4 Manage, monitor and initiate recoveries and direct charges for NML and NCFAD client-funded fit-ups and projects.

1.5 Assist RPSSD managers with efficient staffing processes by

- assisting RPSSD managers to identify the most effective means of staffing and identifying opportunities for collaborative staffing activities;
- providing staffing support services;
- maintaining the branch organization charts and salary information to ensure the accuracy of information in SAP.

1.6 Maintain and update the CSCHAH Investment Plan to identify, prioritize and schedule Investment Plan projects and determine related budgetary requirements.

Goal#2 Contribute to the effective financial management of the RPSSD division through effective procurement activities.

Activities / Outputs

2.1 Assist in establishing short/long-term contracts for projects identified on the Investment Plan and or shorter-term building upgrades and modifications, refits, alterations and service contracts required to maintain the day to day operation of the CSCHAH, 820 Elgin and JC Wilt facilities. This is accomplished by:

- providing advice and assistance to RPSSD staff regarding the development of contract requirements;
- coordinating the development of contracts by initiating the requirement and liaising with PHAC MAMD and PWGSC as required through to contract award;
- monitoring and reporting on the progress of projects identified on the Investment plan;
- ensure contracts comply with Treasury Board and Deparmental policies, codes, standards and environmental stewardship;

2.2 Ensure procurement for goods and services are processed following established PHAC procedures.

Goal #3 Effective operational support of RPSSD for its clients.

Activities / Outputs

3.1 Provide cost-effective support services to RPPSD (e.g., purchasing, contracting, invoice processing, account reconciliation, records management, reporting, training, coordination of travel approvals and booking arrangements).

3.2 Ensure consistency regarding administrative procedures by creating and updating the RPSSD Administrative Procedures Manual;

3.3 Support RPSSD facilities and client-related activities through the use and support of the CMMS work order system.

3.4 Provide contract life-cycle administration services to ensure that RPSSD and its clients have valid contractual instruments to meet operational requirements.

Goal#4 Contribute to efficient building management support for RPSSD.

Activities / Outputs

4.1 Enable accurate and efficient tracking of specialized building costs including long term capital plan projects to support the ongoing building cost study reports.

4.2 Implement efficient processes to support the delivery of client-funded fit-ups and projects for NML and CFIA including obtaining approvals, tracking costs and payment / recovery processes.

4.3 Coordinate, administer and manage contracts for services related to the operational functioning of the CSCHAH, 820 Elgin and JC Wilt facilities (janitorial services, waste removal, pest control, grounds keeping and snow removal, maintenance of first aid kits and AED units). Ensure common building areas are operated and maintained to optimal standards.

Goal#5 **Contribute to the Agency's sustainable development strategy and environmental management goals.**

Activities / Outputs

5.1 Explore new sustainable development opportunities and incorporate them into building service contracts.

Quality Systems

The Quality Systems unit, led by Daryl Boehm, is responsible for:

- ✓ managing the RPSSD Help Desk
- ✓ operation of the CMMS (Computerized Maintenance Management System)
- ✓ supporting the Purchase Order function and facilitating the process with the Property Services Unit, including problem resolution
- ✓ maintaining the (RBS) Rendering and Biowaste System's ISO 9001:2008 certification
- ✓ updating SOPs and applicable documentation
- ✓ maintaining operational RBS records
- ✓ completing internal audits and facilitating compliance audits of the RBS
- ✓ staff training and orientation of the ISO Quality Management System
- ✓ support RPSSD Project Management function
- ✓ assist with Sustainable Development initiatives
- ✓ facilitating compliance with external standards and regulations
- ✓ supporting external activities related to maintenance management on the CL-3 mobile truck lab and portable Mobicon units

2014-15 Goals, Activities / Outputs

Goal#1 **Optimizing the operation of the MP2 Computerized Maintenance Management System**

Activities / Outputs

1.1 Review and quality assurance of RPSSD Purchase Orders/Work Orders.
1.2 Assist in resolution of financial issues pertaining to Purchase Orders.
1.3 Responding to staff problems and issues, trouble shooting and problem resolution.
1.4 Ongoing review of CMMS and investigation of improvements.
1.5 Initial and ongoing staff training on CMMS.

Goal#2 **Maintaining the RBS ISO 9001:2008 Certification**

Activities / Outputs

2.1 Facilitate and support annual compliance audits to ensure ongoing certification.
2.2 Schedule and guide the internal audit process.
2.3 Train and support internal auditors.
2.4 Create and maintain SOPs, Work Instructions and Forms.
2.5 Ensure proper storage and retention of pertinent records.
2.6 Support the RBS personnel operational and safety training.

Goal#3 **External Environmental Standards and Regulation Management**

Activities / Outputs

3.1 Assist in staff awareness of applicable standards and regulations.
3.2 Maintain applicable documents and records.

Goal#4 **Sustainable Development**

Activities / Outputs

4.1 Investigation of existing and new standards and regulations for possible inclusion in an ISO 9001 format.

4.2 Assist in managing programs and staff awareness.

JC Wilt Facilities Management Unit

The JC Wilt Facilities Management Unit, led by Don Whitworth, is responsible for:

- ✓ Ensuring the building's architectural, mechanical, electrical, plumbing and heating and cooling systems are functioning at the optimum level through the day-to-day operation and maintenance of the building systems.
- ✓ Providing project management, implementation and commissioning services for client, base-building and long-term capital projects
- ✓ Managing, operating building automation control system and ventilation delivery infrastructure which provides continuous fall-safe laboratory operations

2014-15 Goals, Activities / Outputs

Goal#1 **Provide an uninterrupted laboratory operating environment to meet JC WILT mission-critical program mandates.**

Activities / Outputs

1.1 Adhere to a preventative maintenance program and monitor, maintain, and service the facility's heating, cooling and humidification plants.

1.2 Carry out proactive, planned, timely maintenance to ensure heating and cooling systems' optimal functioning and reliability, reduce equipment failure, reduce / avoid costs for remedial actions, and minimize program interruption.

1.3 Carry out a Preventative Maintenance program to enhance the capacity to monitor, maintain and service the facility's equipment and base-building system.

1.4 Carry out proactive, planned, and timely maintenance to ensure optimal building systems functions and reliability, reduce/minimize equipment failure, reduce / avoid costs for remedial actions, and minimize program interruption.

1.5 Respond to and complete emergency maintenance on a priority basis

1.6 Support RPSSD facilities and client-related activities through the use and management of the Computerized Maintenance Management System (CMMS) work order system.

1.7 Provide one-point-of-contact service for all occupants of JC Wilt through the Facility Help Desk

Goal#2 **A safe and secure environment through the effective management of the Building Automation System.**

Activities / Outputs

2.1 Ensure containment in the enhanced laboratory by maintaining adequate directional airflow.

2.2 Ensure operations and control programs are routinely reviewed and updated to ensure fail-safe operation.

2.3 Maintain the integrity of the system and calibration repair / replacement of all points on a scheduled basis

2.4 Ensure repairs and maintenance is completed on schedule, minimize Unplanned shutdowns that may affect laboratory containment or program delivery.

2.5 Maintain the certification and calibration of critical O2 and breathing air System.

2.6 Maintain the laboratory equipment monitoring alarm system which

2.7 Maintain good operation of comfort controls

Goal#3 Effectively managed projects for retrofits, renovations, alterations and client-funded refits.

Activities / Outputs

3.1 Ensure all projects comply with Treasury Board, departmental, and accepted industry policy standards (e.g., building codes, ASHRAE air quality codes, Canadian Laboratory Biosafety Guidelines, Canada Labour Code).

3.2 Provide project management of base-building projects, building system upgrades and modifications, refits and alterations without compromise to the integrity of the facility's life-safety systems and biocontainment capabilities while conforming to regulations, codes and standards. Projects include:

- Fork Lift Pad
- York Chiller Guards
- Ventilation Ganging Exhaust Fans
- Guard Status Autoclave Boilers
- Humidification Electrical Unit

REAL PROPERTY, SAFETY and SECURITY - Budgets and Staffing

Salary Funding (PHAC A-base, CFIA Cost-Recovery)

Annualized Salaries*:	$4.68M
Approved FTEs:	61

O&M Funding(PHAC A-base, CFIA Cost-Recovery)

Notional O&M:	$8.245

LTCP Funding (Sources: TB Sub #831577)

Baseline LTCP:	$4.5M

Corporate Services

The National Microbiology Laboratory is supported by Corporate Services that report directly to their functional directorates in Ottawa. These Corporate Services include Finance, Human Resources, Communications and Information Management / Information Technology. Following Budget 2012, various factions of corporate services merged with their Health Canada counterparts to form a shared services core for both departments and considerable reorganization followed.

A close relationship and focus on client services is imperative for the continued successful operation of NML scientific programs and business areas. As these areas grow to service a client base beyond NML, the coordination and communication of requirements and services have become increasingly important and challenging.

Finance

The merger of a number of financial units within PHAC and Health Canada has resulted in many changes in service delivery for NML.

PHAC's Resource Management and Analysis Division (RMAD) of the Office of the Chief Financial Officer now provides interdepartmental salary invoices for NML while also providing considerable support to NML Program Services and Support unit. The Health Canada Chief Financial Officer Branch (CFOB), Financial Operations Directorate provides the following services:

- processing accounts payable, which includes exercising Section 33 authority for all NML operating and maintenance payments;
- processing accounts receivable, cash deposits,
- maintaining a database of delegated signing authorities to ensure proper financial delegation and accountability of expenditures;
- ensuring the proper issuance and use of acquisition cards and that monthly statements for acquisition cards are supported by appropriate documentation / signing authorities;
- performing a SAP security role in ensuring proper access to the SAP financial management system.

Human Resources

The Corporate Services Branch (CSB) provides corporate support and services nationally for the Public Health Agency of Canada and Health Canada. Human Resources services for the NML are provided primarily through the Manitoba Regional HR Unit. The Manitoba Human Resources team is led by Debbie Curtis, Regional Director, Human Resources.

In an effort to provide access and service to NML, Human Resources Advisors are onsite weekly. Debbie Curtis and Tammy Kardoes (Manager of HR Client Services) are members of the NML Management Council.

Human Resources services include:

- pay and benefit services to all NML staff transitioned from the Ottawa compensation team to the PWGSC Pay Centre in Mirimishi New Brunswick as of the fall of 2013; regional HR has retained a compensation liaison function as well as a trusted source function which entails validating section 34 authorities on certain pay transactions prior to processing via the Pay Centre;
- assisting managers in the preparation of accurate, consistent work descriptions;
- advising NML managers and staff of classification standards;
- advising NML managers and staff of legislative and policy interpretations on issues such as harassment, discipline, performance, communication, strike related activites and other labour relations issues;
- supporting managers in the performance management process as outlined under the new TBS Performance Management Framework;
- support in establishing and maintaining a Labour Management Consultation Committee at the NML;
- providing training for managers and supervisors on various HR and leadership related topics;
- providing training and information sessions to NML staff on various HR topics;
- providing advice and guidance to managers and supervisors in the area of staffing and recruitment;
- beginning in the summer of 2014 SERES, SEREM and EX (-01) staffing support will be provided out of the Manitoba Regional HR Unit (a transition from EX Services);
- providing advice and guidance to managers and supervisors on HR process and documentation requirements in various HR functions;
- advising NML management of legislative and policy interpretation obtained via Corporate HR and/or central agencies;
- support and guidance pertaining to team building activities; and
- providing advice and one-on-one counselling to help nurture effective management strategies, best practices and organizational wellness.

Communications

The NML Communications Team plays an important role for the facility by:

- Working with local, national and international media to increase public awareness of the research/scientific work being conducted by Agency employees.
- Ensuring open and transparent communications principals are maintained to uphold and enhance the trust and confidence of the community.
- Developing emergency communications protocols to ensure employees and members of the public are quickly informed of any event that could affect their safety/security.

The NML Communications Team provides a wide range of services:

- providing strategic communications planning and advice to management on relevant communication policies and procedures;
- developing all communications products to support NML programs and projects, this includes communications plans, protocols, media lines, news releases, social media strategies etc.
- keeping the program leads informed of news reports related to their fields of interest by monitoring and distributing related media material;

- managing all media requests for NML specific enquiries, this includes:
    - providing information to media
    - negotiating and coordinating interviews
    - providing media training to identified Agency spokespersons
    - coordinating and managing NML-related media events

Security Operations

The Security Management Division (SMD) of Health Canada is now responsible for the management of the comprehensive security program at CSCHAH to protect physical assets, information and personnel. The Security Operations area is staffed by a Manager and an Access Control and Admin Officer who both report to SMD. The Manager of Security Operations, Chad Pucknell, is responsible for overseeing the management of the security guard force for the purpose of protecting personnel and physical assets. The management and training for the x-ray screening systems, CCTV monitoring and access control systems at the CSCHAH also falls under SMD's authority. SMD provides personnel security screening for all staff, contractors and visitors to the CSCHAH. SMD establishes security policies and standards to protect staff, information and physical assets and conducts security sweeps and threat and risk assessments, as required. The SMD provides 24/7, on-call access to the Security Manager or equivalent for the purpose of reporting security related concerns with response to the site as required. SMD also acts as the investigative authority when incidents of loss or theft and workplace violence occur at CSCHAH.

APPENDIX A: Business Plan Acronyms

AAFC	Agriculture and Agri-Food Canada
ABRP	Applied Biosafety Research Program
ADM	Assistant Deputy Minister
AFLP	Amplified Fragment Length Polymorphism
AI/PI	Avian Influenza/Pandemic Influenza (Treasury Board Submission)
ASHRAE	American Society of Heating, Refrigeration and Air-Conditioning
BERT	Building Emergency Response Team
BIMS	Business and Information Management Services
BK Virus	Type of human polyomavirus
BLT	Bone marrow/Liver/Thymus
BOPs	Business Operations
BSE	Bovine Spongiform Encephalopathy
BT	Bioterrorism
CA-MRSA	Community-associated, methicillin-resistant *Staphylococcus aureus*
CAHSN	Canadian Animal Health Surveillance Network
CBRNE	Chemical Biological Radiological Nuclear and Explosive
CCDIC	Centre for Communicable Diseases and Infection Control
CD4	Cluster of differentiation 4 - a glycoprotein expressed on the surface of T helper cells
CDC	Centres for Disease Control
CEN	Comité Européen de Normalisation - European Committee for Standardization
CFEZID	Centre for Foodborne, Environmental and Zoonotic Infectious Diseases
CFIA	Canadian Food Inspection Agency
CHMS	Canadian Health Measures Survey
CIDA	Canadian International Development Agency
CIDPC	Centre for Infectious Disease Prevention and Control
CIHR	Canadian Institutes of Health Research
CIPARS	Canadian Integrated Program for Antibiotic Resistance Surveillance
CIRID	Centre for Immunization and Respiratory Infectious Diseases
CISTI	Canada Institute for Scientific and Technical Information
CJD	Creutzfeldt-Jakob Disease
CJDSS	Canadian Creutzfeldt-Jakob Disease Surveillance System
CL	Containment Level
CLC	Community Liaison Committee
CLRN	Canadian Laboratory Response Network
CLSI	Clinical Laboratory Standards Institute
CLSN	Canadian Laboratory Surveillance Network
CMMS	Computerized Maintenance Management System
CNISP	Canadian Nosocomial Infection Surveillance Program
CNPHI	Canadian Network for Public Health Intelligence
CPHLN	Canadian Public Health Laboratory Network
CPHO	Chief Public Health Officer
CPIP	Canadian Pandemic Influenza Plan for the Health Sector
CRI	Congenital Rubella Infection
CRS	Congenital Rubella Syndrome
CRTI	CBRN Research and Technology Initiative
CSCHAH	Canadian Science Centre for Human and Animal Health
CSSP	Canadian Safety and Security Program ('CSSP' previously CRTI)
CTLTN	Canadian Tuberculosis

	Laboratories Technical Network
CVC-BSI	Central Venous Catheter - Associated Bloodstream Infection Surveillance
CWD	Chronic Wasting Disease
DFAIT	Department of Foreign Affairs and International Trade
DNA	Deoxyribonucleic acid
DND	Department of National Defense
DRDC	Defence Research and Development Canada
DSTL	Defence Science and Technology Laboratory (UK)
E. coli	*Escherichia coli*
EBV	Epstein-Barr Virus
ECG	Encephalitis Collaborating Group
EDPLN	Emerging and Dangerous Pathogens Laboratory Network
EEEV	Eastern Equine Encephalitis Virus
ELISA	Enzyme-Linked Immunosorbant Assay
ELISPOT	Enzyme-linked Immunosorbent Spot (assay)
EMCS	Energy Management Controls System
EOC	Emergency Operations Centre
EQA	External Quality Assurance
ERP	Emergency Response Plan
ERAP	Emergency Response Assistance Plan
ESBL	Extended-spectrum beta lactamase
FBI	Federal Bureau of Investigation
F/P/T	Federal/Provincial/Territorial
FSWEP	Federal Student Work Experience Program
FTE	Full-Time Employee
GHSAG	Global Health Security Action Group
GHSI	Global Health Security Initiative
GIS	Geographic Information System
GladNet	Global Laboratory Network
GOC	Government of Canada

GRDI	Genomics Research and Development Initiative
H5N1	Novel Avian Influenza – hemagglutinin 5 neuraminidase 1
H7N3	Novel Avian Influenza - hemagglutinin 7 neuraminidase 3
HA	Hemagglutinin
HAI	Hemagglutination inhibition assay
HAI	Haemagglutination Inhibition (Assay)
HAV	Hepatitis A virus
HBOV	Human Bocavirus
HBV	Hepatitis B virus
HCV F	Hepatitis C virus - F protein
HCV	Hepatitis C virus
HDV	Hepatitis D virus
HEPA	High Efficiency Particulate Air
HEV	Hepatitis E virus
HHV-6	Human Herpesvirus 6
HHV-8	Human Herpesvirus 8
HIV	Human Immunodeficiency virus
HLA	Human Leukocyte Antigen
HMPV	Human Metapneumovirus
HPTA	*Human Pathogens and Toxins Act*
HPV	Human Papilloma Virus
HSV	Herpes Simplex Virus
HSV1	Herpes Simplex Virus - Type 1
HTLV	Human T-Lymphotropic Virus
HVAC	Heating, Venting, Air-Conditioning
IBC	Institutional Biosafety Committee
ICID	International Centre for Infectious Diseases
ICS	Incident Command System
IDPC	Infectious Disease Prevention and Control (Branch)
IgG	Immunoglobulin G
IgM	Immunoglobulin M
ILA	Internal Letter of Agreement
IM/IT	Information Management/Information Technology
IMPACT	Immunization Monitoring Program ACTive
IP	Intellectual Property

IRMS	Integrated Risk Management Standard
ISO	International Standards Organization
IT	Information Technology
iTRAQ	isobaric tag for relative and absolute quantitation
JC Virus	John Cunningham virus
KIWI	Knowledge Integration based on Web-based Intelligence
KIR	killer cell immunoglobulin-like receptor
LC	Liquid Chromatography Mass Spectrometry
LEMAS	Laboratory Equipment Monitoring and Alarm System
LFZ	Laboratory for Foodborne Zoonoses
LIMS	Laboratory Information Management System
LGV	Lymphogranuloma Venereum
LLTO	Laboratory Liaison Technical Officer
LRN	Laboratory Response Network
LTCP	Long Term Capital Plan
mAbs	Monoclonal antibodies
MAF	Management Accountability Framework
MARS	Measles and Rubella Surveillance
MDR	Multi-drug resistant
MHC	Major histocompatibility complex
MIA	Multiplex Immunoassay
MLISA	Multi-lateral Information Sharing Agreement
MLST	Multi-Locus Sequence Typing
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MRSA	Methicillin Resistant *Staphylococcus Aureus*
MS	Mass Spectrometry
MSF	Medecins Sans Frontieres (Doctors Without Borders)
MTA	Municipal Type Agreement
MVLA	Multiple Locus Variable Number Tandem Repeat Analysis
NA	Neuraminidase
NCFAD	National Centre for Foreign Animal Diseases
NESP	National Enteric Surveillance Program
NHP	Non-human primate
NHRL	National HIV and Retrovirology Laboratories
NML	National Microbiology Laboratory
NRC	National Research Council
NRCM	National Reference Centre for Mycobacteriology
NRC-CISTI	National Research Council - Canada Institute for Scientific and Technical Information
NRCP	National Reference Centre for Parasitology
NS1	Non-Structural Protein 1
NSERC	Natural Sciences and Engineering Research Council of Canada
O&M	Operating and Maintenance
OBM	Office of Biorisk Management
OC	Operations Centre
P/T	Provincial/Territorial
PAA	Program Alignment Architecture
PAHO	Pan American Health Organization
PBMC	Peripheral Blood Mononuclear Cell
PCR	Polymerase Chain Reaction
PCIRN	PHAC/CIHR Influenza Research Network
PFGE	Pulsed Field Gel Electrophoresis
PHAC	Public Health Agency of Canada
PHDIM	Public Health Daily Intelligence Meeting
PHL	Public health laboratory
PMF	Performance Management Framework
PRN	Plaque Reduction Neutralization (Assay)
P/T	Provincial/Territorial
PWGSC	Public Works and Government Services Canada
RCA SC	Reference Centre Advisory Subcommittee
RDIMS	Records, Document and Information Management

	System
RFID	radio frequency identification
RNA	Riblonucleic acid
RPP	Report on Plans and Priorities
RPSS	Real Property, Safety and Security
RPSSD	Real Property, Safety and Security Division
RSV	Respiratory Syncytial Virus
RT-PCR	Reverse Transcription Polymerase Chain Reaction
SARS	Severe Acute Respiratory Syndrome
SARS-CoV	Severe Acute Respiratory Syndrome Coronavirus
SCC	Standards Council of Canada
SDG	Scientific Director-General
SES	Safety Environmental Services
SNP	Single Nucleotide Polymorphism
SOP	Standard Operating Procedure
SPP	Special Pathogens Program
SSPE	Subacute Sclerosing Panencephalitis
STD	sexually transmitted disease
STI	sexually transmitted infection

NOTES

TAT	Turn-around-time
TB	Treasury Board
TRA	Threat Risk Assessment
TSE	Transmissible Spongiform Encephalopathies
TSWG	Technical Support Working Group
UK	United Kingdom
UK HPA	United Kingdom Health Protection Agency
US	United States
vCJD	variant Creutzfeld-Jakob Disease
VLPs	Virus-like particles
VSV	Vesicular Stomatitis Virus
VRE	Vancomycin-Resistant *Enterococci*
VZV	Varicella-Zoster Virus
WCSC	Winnipeg Common Services Centre
WHO	World Health Organization
WNV	West Nile virus
XDR-TB	Extreme Drug Resistant Tuberculosis
ZDSP	Zoonotic Diseases & Special Pathogens