



Public Health
Agency of Canada

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Public Health Agency of Canada



National Microbiology Laboratory

Report of Accomplishments

Excellence • Innovation • Leadership

To promote and protect the health of Canadians through leadership, partnership, innovation and action in public health.

– Public Health Agency of Canada

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Message from the Chief Public Health Officer



NML, with its dedicated staff and strong partnerships, will continue to excel as a leading public health laboratory, respected nationally and internationally.

*David Butler-Jones MD, MHSc, FRCPC, CCFPC, FACPM
Chief Public Health Officer
Public Health Agency of Canada*

I am pleased to have this opportunity to acknowledge the invaluable contributions of the National Microbiology Laboratory (NML) in helping the Public Health Agency of Canada (PHAC) fulfill its commitment to protect and promote the health and safety of Canadians.

Public health often gets the most attention during times of crisis, while most of the work actually takes place in advance - in preparation and planning. In many ways, the contribution of NML cannot be measured - we can never count how many outbreaks were avoided or how many illnesses were prevented. PHAC staff generally work behind the scenes, quietly making a difference in the lives of Canadians. It is important that we stop once in awhile and recognize them for these efforts.

Over the years, NML has demonstrated incredible leadership, both nationally and internationally. Whether it was to lead the Global Health Security Action Group Laboratory Network, or developing an Ebola vaccine, or creating the Canadian Network for Public Health Intelligence, their accomplishments are outstanding. As Canadians, we should be proud of their efforts.

I commend NML for undertaking this initiative to look back at their accomplishments and renew their commitment and vision for the future. I have every confidence that

The Public Health Agency of Canada

In September 2004, the Public Health Agency of Canada was created to deliver on the Government of Canada's commitment to help protect the health and safety of all Canadians through increasing its focus on public health. Canada's Chief Public Health Officer (CPHO) heads the Agency, which reports along with Health Canada to the federal Minister of Health.

The Public Health Agency of Canada Act, which came into force in December 2006, mandates the Agency to:

- Strengthen Canada's ability to protect the health and safety of Canadians
- Oversee federal efforts to strengthen national capacity to identify and reduce risks to public health
- Develop, implement and assess policies and programs that enable Canadians to live healthier lives

The creation of the Agency and appointment of the CPHO as deputy head, public health advisor to the Minister and lead public health professional in Canada, marked the beginning of a new approach to federal leadership; and the advent of improved collaboration with the provinces and territories in the Government's efforts to renew Canada's public health system.

Message from the Scientific Director General



I am pleased to present the National Microbiology Laboratory's first Report of Accomplishments which highlights our major achievements and outlines our future direction.

While the Canadian Science Centre for Human and Animal Health (CSCHAH), home to the National Microbiology Laboratory (NML), held its official opening in June 1999, some of its first labs actually began operating in 1998. Since then, NML has played a leading role in Canada's response to several public health challenges, including the appearance of the West Nile virus on the continent in 1999 and its spread westward and the laboratory response to SARS in Canada in 2003. Some of these challenges tested our capacity, but they also provided tremendous learning opportunities that have allowed us to improve and grow.

This period also saw the creation of the Public Health Agency of Canada (PHAC), established to strengthen the Government of Canada's ability to protect the health and safety of Canadians and to provide a national focal point to lead efforts in the advancement of public health both nationally and internationally. As Canada's leading public health infectious disease laboratory, NML plays a very significant role within the Agency. Its focus is on preventing and controlling the spread of infectious disease through performing the core functions of reference and diagnostic services, surveillance, applied and discovery research, development and training, and emergency preparedness and outbreak response. Each of these activities contributes directly to the health of Canadians.

We know that infectious disease threats are not going to go away. Thirty new pathogens have emerged over the last thirty years and existing ones continue to re-emerge, often with the additional challenge posed by antimicrobial resistance. NML is working hard to address existing threats and to prepare for what may lie ahead. But we are not alone in this endeavour. By working together with our stakeholders and our partners, we will succeed in reducing the impact of infectious diseases. In particular, I'd like to recognize the efforts of our partner in CSCHAH, the Canadian Food Inspection Agency's National Centre for Foreign Animal Disease, as well as the Canadian Public Health Laboratory Network and our PHAC colleagues in Ottawa and across the country who all work closely with us on a daily basis.

I also want to thank every single member of the NML team, each of whom contributes to the success of this organization. I look forward to working with them as we continue to build on our achievements.

Francis A. Plummer O.C., MD, LL.D., FRCPC, FRSC
Scientific Director General
National Microbiology Laboratory
Public Health Agency of Canada

Introducing the National Microbiology Laboratory

Unique in the World

The Public Health Agency of Canada's primary role is to lead federal efforts and mobilize pan-Canadian action in preventing disease and injury and promoting and protecting national and international public health. As a central player in the Infectious Disease and Emergency Preparedness Branch, the National Microbiology Laboratory (NML) supports Canada's efforts in preventing and controlling infectious diseases by providing national public health laboratory services and conducting applied and discovery research into established, emerging and rare infectious diseases.

NML is co-located with the Canadian Food Inspection Agency's National Centre for Foreign Animal Disease (NCFAD) at the Canadian Science Centre for Human and Animal Health (CSCHAH) in Winnipeg, Canada. The CSCHAH is unique in its capacity to accommodate the study of infectious diseases in both humans and animals at the highest level of bio-containment. Housing Canada's only operational containment level 4 laboratory, this state-of-the-art facility is a leading member of an elite group of centres worldwide that are equipped with containment level 2, 3 and 4 laboratories designed to safely accommodate the most basic to the most deadly infectious organisms.

As a pillar of PHAC, NML sets its direction and conducts its operations in a manner that upholds the vision and mission and furthers the objectives of the Agency.

All in a Day's Work

NML combines a public health reference laboratory mandate with internationally-recognized research programming targeting established, emerging and rare pathogens. The activities involved in maintaining this dual focus are performed both directly, through the efforts of NML staff, and indirectly, through partnerships with PHAC colleagues and other federal departments or agencies as well as external organizations (e.g., academic institutions, provincial laboratories, regional health authorities, international health organizations). Regardless of who is

involved, all of NML's scientific activities are undertaken by four laboratory divisions, complemented by shared core science and business support programs. The four laboratory divisions, each of which comprises disease- or function-specific areas, include:

Bacteriology and Enteric Diseases - focuses on bacterial diseases, including community-acquired infections such as tuberculosis, bacterial sexually transmitted infections and meningitis, hospital-acquired infections and multi drug resistant organisms, and enteric food- and water-borne pathogens, such as *E.coli* and *Salmonella*

Prion Diseases - specializes in transmissible spongiform encephalopathies, such as Creutzfeldt-Jakob disease (CJD) and Bovine Spongiform Encephalopathy (BSE)

Viral Diseases - targets viral diseases including hepatitis A-E and other blood-borne pathogens, respiratory viruses, viral exanthemata, such as measles, and viral sexually transmitted diseases, such as human papillomavirus

Zoonotic Diseases and Special Pathogens - focuses on viral, bacterial and rickettsial zoonoses (i.e. diseases transmitted to humans from other species), such as West Nile virus, as well as containment level 4 agents, such as Ebola, Marburg and Lassa fever.

All of the scientific activities performed by NML divisions fall into five main categories. Fundamental to the fulfillment of both the laboratory's and the Agency's mandate, these core functions include:

Reference and Diagnostic Services - involves low-volume diagnostic testing, confirmatory testing, quality control and quality assurance activities (e.g., provision of quality control reagents, proficiency testing programs), method development and evaluation, and technology transfer (e.g., standardized protocols)

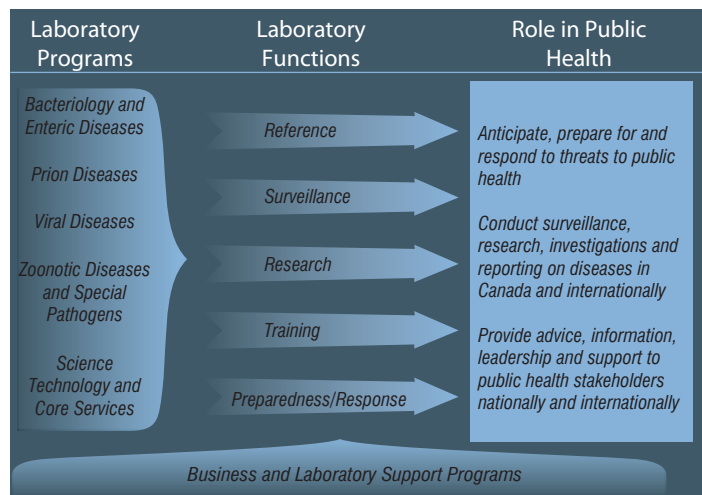
Surveillance Activities - undertaken in cooperation with PHAC colleagues and other federal partners as well as provincial and territorial stakeholders, involves monitoring the potential emergence of new or rare diseases, monitoring and documenting the elimination of established diseases, and monitoring trends in nationally reportable diseases in Canada, for the purpose of timely and appropriate public health action.

	VISION	MISSION
Public Health Agency of Canada	<i>Healthy Canadians and communities in a healthier world.</i>	<i>To promote and protect the health of Canadians through leadership, partnership, innovation and action in public health.</i>
National Microbiology Laboratory	<i>A world-class organization dedicated to the protection of Canadian and global public health.</i>	<i>Advance human health through laboratory leadership, scientific excellence, and public health innovation.</i>

Applied and Discovery Research - conducted in collaboration with Canadian and international partners, comprises applied research activities, such as vaccine or diagnostic technology development and evaluation, and discovery research activities, aimed at gaining an improved understanding of biological systems

Development and Training - involves the provision of training opportunities for Canadian and international research scientists and public health professionals as well as the delivery of internship programs for post-doctoral fellows and graduate and undergraduate students

Emergency Preparedness and Outbreak Response - involves monitoring developments worldwide and preparing for and supporting national and global emergency response efforts targeting acute infectious disease outbreaks as well as bio-terrorism threats or other deliberate acts involving infectious agents



Rich History of Achievement

An Auspicious Start

Since the completion of the Canadian Science Centre for Human and Animal Health (CSCHAH), both the National Microbiology Laboratory (NML) and National Centre for Foreign Animal Disease have been at the forefront of international infectious disease research. In addition to becoming the first facility in the world to accommodate both human and animal research, CSCHAH housed Canada's first level 4 bio-containment laboratory along with its level 2 and level 3 laboratories. With this enhancement of its public health laboratory infrastructure, Canada had joined only a handful of countries capable of working with the world's most deadly pathogens.

Close to a decade after its official opening, the NML is fulfilling its promise. From a starting complement of fewer than 100 staff, NML is now home to more than 400 employees; among them some of the world's most accomplished research scientists. At the same time, NML has cultivated an exceptional training environment

for the study of microbiology and infectious diseases; well over 100 post-doctoral fellows and graduate and undergraduate students are supervised by NML scientists in a given year. Through the successful union of this wealth of talent and its state-of-the-art facilities, NML now boasts a portfolio of 24 patents and patents pending, along with an impressive and growing repertoire of cutting-edge tools and scientific breakthroughs that are helping to stem the spread of infectious diseases in Canada and around the world.

Some of the key contributions and achievements of NML over the past few years are highlighted below.

Reference and Diagnostic Services

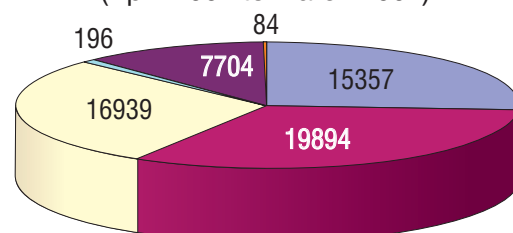
Canadian and international clients alike have come to rely on NML for its wide range of reference and diagnostic testing capabilities. Whether providing required expertise or supplementing local capacity, NML performs tens of thousands of tests per year involving a full spectrum of infectious disease pathogens.

A multitude of different test types are offered by NML, the majority of which fall into one of the following categories: culture (growth of a microorganism) and identification; nucleic acid tests (e.g., polymerase chain reaction); susceptibility testing (determination of the ability of an antibiotic to kill or inhibit bacterial growth); and pathology (examination of organs, tissues, cells and body fluids).

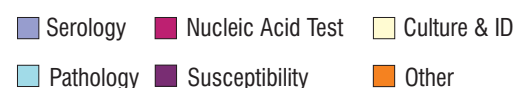
Where it does not offer them in-house, NML funds external laboratories to provide specific microbiological reference services. Laboratories currently partnering with NML include the National Reference Centre for Parasitology (McGill, Montreal) and the National Centre for Streptococcus (ProvLab Alberta, Edmonton). In addition, NML supports the recently established National Mycology Network, whose function is to identify and collaborate on priority activities such as surveillance and diagnostics for fungi.

Committed to ensuring excellence in its reference and diagnostic services, NML has attained ISO17025 accreditation, an international standard governing the "general requirements for the competence of testing and calibration laboratories." The Standards Council

Total Number of Samples per Test Type*
(April 2004 to March 2007)

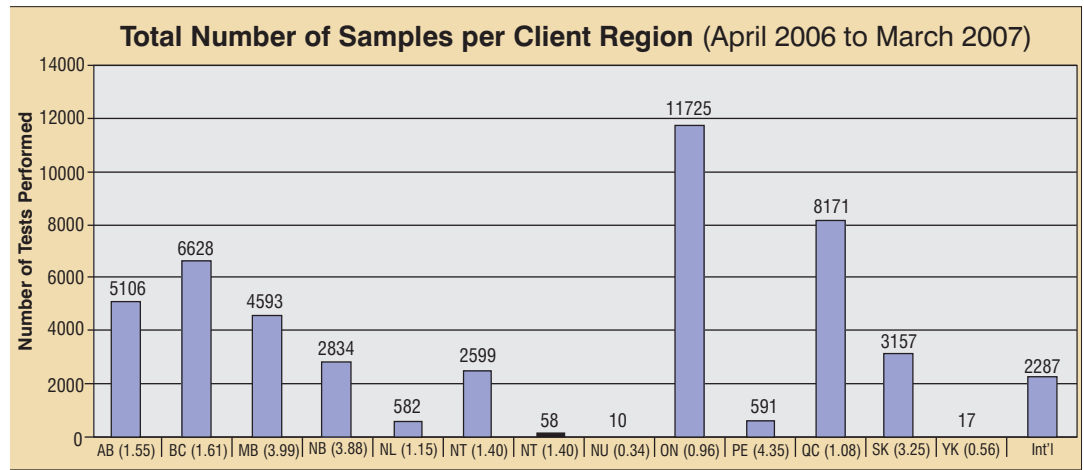


*Multiple tests are performed on some samples



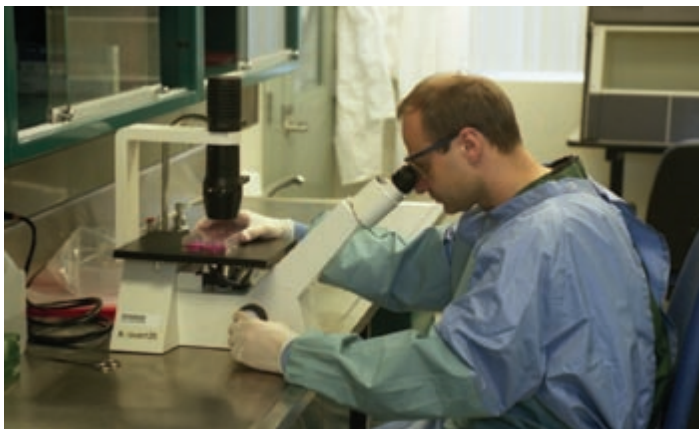
of Canada (SCC) is the accrediting body. A fundamental component of the ISO17025 quality system is continual improvement; to date, 34 widely performed tests in 10 laboratory sections have been accredited or assessed for accreditation by the SCC, with work ongoing to increase the scope of accreditation.

In addition to ensuring the quality of its own testing services and equipment, NML divisions provide advice, standards and training to client laboratories. This increases their capacity to conduct testing for surveillance and produce and verify the quality of laboratory reagents.



Region (samples per 1000 residents)

- Coordination of Canada's National Enteric Surveillance Program and entering into a Memorandum of Understanding with the US Centers for Disease Control (CDC)-based PulseNet (early warning systems for outbreaks of food-borne disease). This includes supporting surveillance through DNA "fingerprinting" on bacterial isolates from laboratory-confirmed cases of food-borne illnesses such as *Salmonella*, *Shigella*, *Listeria* and *E. coli*
- Leadership in the development of a preliminary blueprint for national human papillomavirus (HPV) surveillance, and initiation of intensive monitoring of possible changes in viral genotype due to the introduction of immunization - critical steps in ensuring that future vaccine versions cover the greatest proportion of the carcinogenic variants of HPV
- Coordination of national surveillance of Creutzfeldt-Jakob disease (CJD) and previously unobserved prion diseases (e.g., Chronic Wasting Disease in humans), as well as sharing of aggregate statistics through membership in the European and Allied Countries Collaborative Study Group of CJD



In 2006-2007, NML conducted more than 50,000 tests for Canadian laboratories from coast to coast as well as for international clients.

Surveillance Activities

As of 2007, PHAC was participating in upwards of 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. Described below are some ways in which NML supports national and global infectious disease surveillance, in cooperation with PHAC and other federal colleagues as well as provincial, territorial and international partners.

- Development and implementation of a national surveillance system to address the incursion and spread of West Nile virus in Canada, including the provision of diagnostic tests and national guidelines as well as regular reports documenting West Nile activity
- Support for national and global influenza surveillance and assessment of pandemic potential, as a designated World Health Organization (WHO) National Influenza Centre and member of the WHO Global Influenza Surveillance Network

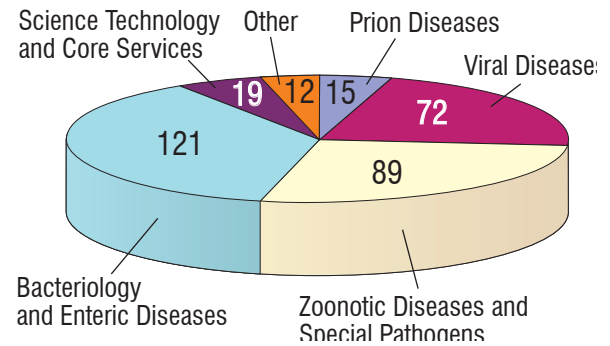
The success of any surveillance system depends on effective information collection and sharing. In addition to its strong ties with national and international partners, NML is quickly establishing itself as a leader in the development of networking technology. Particularly noteworthy is NML's role in the design and operation of the Canadian Network for Public Health Intelligence (CNPHI). A key information technology platform for national surveillance, real-time alerting and response, CNPHI securely connects more than 2,000 public health stakeholders from across Canada. Under the direction of multi-jurisdictional program-led working groups, CNPHI tools are continually being developed and enhanced to facilitate the dissemination of strategic intelligence and coordination of public health responses. In addition, discussions are ongoing with fellow Canadian laboratories and the WHO to extend and adapt CNPHI tools for provincial and international application.

Science Technology and Core Services

In recognition of the rapid pace and enormous impact of technology development, along with the cost of acquisition and inevitable familiarization curve, NML established the Science Technology and Core Services Division. This division combines leading-edge technology and expertise with state-of-the-art equipment to provide in-house research, surveillance and diagnostic support to NML and other CSCHAH and PHAC programs, as well as selected external clients. Areas of specialization include:

- Bioinformatics - provides computer analysis, modeling, visualization, comparison and mining of DNA and protein sequence information
- Genomics - provides DNA synthesis, sequencing, genotyping and microarray analysis, to enable rapid and accurate analysis of infectious disease processes
- Proteomics and Mass Spectrometry - generates and interprets data on protein identity, levels and activity, with the goal of developing candidate diagnostic markers and drug targets
- Monoclonal Antibodies - develops immunoragents and assays critical to research, diagnostic and treatment activities targeting infectious disease threats

Peer Reviewed Publications per Division
(April 2006 to March 2007)



Below are some examples of NML's notable contribution to the advancement of infectious disease research.

- NML was a lead member of a research team that, in NML's level 4 laboratories, recreated the "Spanish flu" virus from the severe 1918 influenza pandemic. Team members have since determined that the unique biology of this virus was responsible for the severity of illness it caused, by illustrating how it stimulated and persistently activated the immune response, ultimately contributing to lethality. This discovery is opening new doors for researchers, including the potential to develop therapies for similar viruses that might emerge in humans.
- NML scientists developed vaccines that protect monkeys from the deadly Ebola, Marburg and Lassa fever viruses – and may one day be found to protect humans. Created in NML's level 4 laboratories, an experimental vaccine for Ebola was injected into mice and found to be effective. Subsequent studies using non-human primates demonstrated the vaccine to be protective and effective post-exposure. The technique used to produce the Ebola vaccine was also used to develop vaccines for Marburg and Lassa fever, which were equally effective.
- More recently, NML researchers worked with scientists from the University of Wisconsin to develop a "safe" form of the Ebola virus. The altered Ebola has a similar structure and growth cycle as wild Ebola, but, without the gene necessary for it to replicate and cause disease, is not infectious. Now scientists can safely study the pathogen in a level 2 as opposed to a level 4 laboratory. With more people studying Ebola's life cycles and potential treatments, the development of the new Ebola virus could very well lead to the creation of a potential vaccine for humans.
- With funding from the Bill and Melinda Gates Foundation, National Institutes of Health and Canadian Institutes of Health Research, NML is partnering with the University of Manitoba, the University of Nairobi and numerous other

Applied and Discovery Research

Complementing its core reference, diagnostic and surveillance functions, NML has established itself as a world class research institute. Undertaken in concert with national and international partners, research into established and emerging infectious diseases, their characteristics, and the means by which they can be transmitted, prevented and treated, generates science-based evidence for the development of public health policies, programs and services as well as the discovery of new therapies and treatments.

From formulating new and improved diagnostic methods, to discovering underlying factors in disease virulence, to developing seed stock for vaccine production, NML's research capabilities and achievements are renowned. NML scientists have contributed to more than 300 national and international research publications in the past three years alone, commendations have been awarded, and patents have been filed or are pending for an impressive array of scientific breakthroughs.

collaborators, to study why some individuals are resistant to HIV infection and others who become infected do not develop AIDS. Understanding what constitutes and results in protective immunity to HIV-1 will greatly advance HIV vaccine research and contribute to the development of novel therapies or treatments to fight HIV/AIDS.



PHAC scientists in Angola, investigating an outbreak of Marburg hemorrhagic fever. While on this mission, NML scientists learned of the success of their Ebola vaccine research.

- NML scientists led the discovery and characterization of the SARS-coronavirus during the 2003 outbreak. Research continues, with the goal of improving diagnostics as well as basic understanding of the SARS-coronavirus and its pathogenesis. Recent NML discoveries involving the human viral receptor hold promise for future anti-viral development.
- NML has made significant contributions to the development and improvement of diagnostic reagents. Most notably, NML developed neutralizing monoclonal antibodies to the SARS-coronavirus, capacity that is now being used to target other public health threats, such as *Neisseria meningitidis*, HIV-1, anthrax, pandemic influenza (H5N1, H7 and others) and botulinum toxins.
- NML researchers have identified a comprehensive list of genes that are consistently affected in rodent models of prion disease. Researchers are now building networks of interactions between these genes, increasing their understanding of the complex inflammatory and neurotoxic cascade of prion disease. Resolving the key factors that underlie prion pathogenesis is providing targets for the design of novel therapies and use of diagnostic biomarkers.

Development and Training

Between the high caliber of its people, its state-of-the-art facilities and its unique capabilities in national and global infectious disease control, NML is called upon daily to share its expertise and capacity. A key way in which

Realigning to Address HIV Commitments

Recent additions to the NML's program areas include the National HIV and Retrovirology Laboratory (NHRL) and the Office of HIV Vaccines.

In August 2008, the NHRL became part of the NML. Over the next three years, the NHRL will be relocated from its current location in Ottawa to the NML in Winnipeg. The NHRL provides a comprehensive range of laboratory services and scientific expertise relating to HIV and emerging retroviruses, and its activities are complementary to those at the NML.

The Office of HIV Vaccines (OHV) has been created to provide secretariat functions and deliver PHAC's program and policy activities under the Canadian HIV Vaccine Initiative (CHVI). Located in Ottawa, the OHV operates under the auspices of the NML.

NML does this is by opening its doors and extending its knowledge through development and training opportunities targeting research scientists, public health professionals and students.

Each year NML programs offer a diverse slate of training courses covering all aspects of the laboratory's operation. Demand and enrollment have continued to increase, with several hundred people participating annually in courses offered on request or at regularly scheduled intervals. Training topics range from research and diagnostic testing methodologies to emergency response training to bio-containment operations and maintenance.

One of the longest running and best known training courses hosted by NML is the annual International High Containment Biosafety Workshop. Now in its seventh year, the workshop is delivered by PHAC, through NML's Office of Biorisk Management, and the International Centre for Infectious Diseases (Winnipeg), along with Smith Carter Architects and Engineers Inc. and the Center for Public Health Preparedness and Research of the Rollins School of Public Health at Emory University. The most advanced of its kind anywhere, the workshop provides training in critical aspects of bio-containment to biosafety professionals, facility operators and managers from around the globe. A rigorous five-day course allows participants to work hands-on in the level 3 and level 4 laboratories of CSCHAH, one of the world's most recognized containment laboratory complexes.

In addition to offering training courses, NML delivers orientation sessions and hosts facility tours for Canadian and international visiting scientists, many of whom are seeking knowledge and inspiration for laboratory construction or operation. As well, residency programs are provided under the supervision of NML scientists to post-doctoral fellows from around the world, local post-graduate medical fellows and graduate students



In 2007, participants came from Kenya, China, New Zealand, Switzerland, Mexico, Singapore, US, Sweden, Germany, and other regions of Canada to attend the 6th Annual International High Containment Biosafety Workshop.

(in collaboration with the University of Manitoba) and undergraduate students from across Canada (through the Federal Student Work Experience Program and Cooperative Education Programs). In 2006-2007, close to 150 individuals worked at NML in internship placements ranging from several months to several years in duration.

Emergency Preparedness and Outbreak Response

Perhaps more than any other, 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 - each activity contributes to the national laboratory's role in preparing for, monitoring, identifying and responding to outbreaks of disease as well as other threats involving infectious agents. Of course, NML is but one of a host of partners whose cooperation underlies the success of any response effort. Under the coordination of PHAC's Centre for Emergency Preparedness and Response (CEPR), NML works alongside other PHAC and federal government colleagues, as well as provincial, territorial and international organizations in outbreak response.

Whether they involve established or exotic diseases, or occur in Canada or elsewhere in the world, NML has become a trusted and sought after resource in preparing for and responding to infectious disease outbreaks. Post 9-11 enhancements to its facilities and operations, along with a desire by national and international partners to strengthen collective emergency response capacity, have served to increase demand for NML support.

International Standard for Laboratory Biosafety and Biosecurity

In November 2007, the first International Standard for Laboratory Biosafety and Biosecurity was approved after three years of hard work. Currently being implemented by laboratories around the world, the standard allows for the establishment of a common biosafety and biosecurity management system that minimizes the risks potentially posed by laboratory operations to employees, the community and the environment.

Through NML, PHAC was a major initiator of this project, along with other key stakeholders (e.g., the European, Asia Pacific and American Biological Safety Associations, WHO, Det Norske Veritas). In addition to representing PHAC in international collaborations, the Scientific Director of NML's Office of Biorisk Management chaired the European Committee for Standardization workshop through which 24 countries unanimously adopted the new standard.

Prior to this initiative, there was no way to verify that facilities throughout the world were properly certified and equipped to safely conduct research involving infectious agents. The lack of a common standard also made it difficult for facilities in different countries to collaborate on research. By providing a mechanism to ensure that they are meeting the same requirements, the newly adopted standard will enable laboratories worldwide to operate on the same page.

Below are some of the ways in which NML is contributing to Canadian and global capacity to prepare for and respond to infectious disease outbreaks or threats.

- In the wake of the 9-11 terrorist attacks, NML hosted directors from the world's high containment laboratories to discuss shared operational and emergency response issues. At the same time, laboratory representatives from the G7 countries and Mexico met to share their concerns and capabilities and to discuss ways of working more collaboratively together. These meetings resulted in the establishment of a laboratory working group of the Global Health Security Action Group (GHSAG). GHSAG is a network of international partners, including the WHO, dedicated to strengthening the public health response to bioterrorist threats and naturally occurring infectious disease outbreaks. NML plays a central role in coordinating the activities of the laboratory working group of GHSAG.
- In 2005, building on its experience with SARS, NML established a state-of-the-art Operations Centre. Featuring a video-wall and the latest networking technologies, the facility enables NML staff to support national and international emergency responses

by monitoring public health developments as they occur, incorporating laboratory results and coordinating laboratory information from various networks and surveillance systems. It also allows for rapid communication and effective coordination with PHAC's Ottawa-based CEPR, provincial public health laboratories and other national and international partners. NML continues to focus on building the relationships, developing the protocols and providing the training necessary for a successful emergency response effort.

- NML operates and maintains two state-of-the-art mobile laboratory units that can be deployed on very short notice to assist with public health crises anywhere in Canada or the world. At the request of the WHO's Global Outbreak and Response Network (GOARN), teams of PHAC scientists are deployed with the laboratory units. Team members work closely with the WHO, local officials and other attending partners, and have extensive experience operating in the most remote areas of the world and the highest risk situations. Since 2003, the mobile laboratory units have responded to outbreaks of Nipah virus in Bangladesh, Crimean Congo hemorrhagic fever in Iran, SARS in Hong Kong and China (2003 and 2004), Ebola virus in the Democratic Republic of the Congo (2003 and 2007), avian influenza in Vietnam, Marburg virus in Angola and Rift Valley fever in Kenya.
- In addition to responding to infectious disease outbreaks, NML's mobile laboratory units are used to enhance national and international capacity to respond to events involving bioterrorism or biowarfare. NML's Microbiological Emergency Response Team (MERT) provides training to national and international partners and coordinates response exercises involving mobile laboratory operations, in-field identification of

biological agents and sampling procedures. MERT also supports national security operations, through mobile laboratory deployment and the development of site security and laboratory response plans. Recently, NML's mobile laboratory unit was deployed to Porton Down, UK for an international training exercise. NML also played a lead role in BI-EX West, a national field exercise designed to enhance Canadian capacity to respond to biological terrorist events.

- Each year, NML divisions participate in the identification and investigation of numerous local, national and international outbreaks of infectious diseases that may not garner media attention, but still have the potential to pose a serious public health threat. Despite the existence of prevention and treatment programs, NML has frequently been called upon to support outbreaks of food-borne illnesses, *Legionella*, tuberculosis, measles, mumps and hepatitis viruses. While new diseases or disease strains are continually emerging, it is the less exotic - but not necessarily less important - diseases that account for the largest share of NML outbreak response activities.

Canadian Public Health Laboratory Network

The Canadian Public Health Laboratory Network (CPHLN) is a national forum of public health laboratory leaders. The aim of the Network is to leverage members' strength in support of public health laboratories and their efforts to provide a rapid and coordinated nation-wide laboratory response to emerging and re-emerging infectious disease threats.

NML funds a dedicated CPHLN Secretariat to work with medical and scientific directors of federal and provincial public health laboratories. The Secretariat supports CPHLN subcommittees addressing laboratory issues related to bioterrorism response, water and food safety, laboratory standardization, and the provision of reference services. In addition, support is provided to working groups addressing pandemic influenza laboratory preparedness, infection control, and disease-specific surveillance.

Since its formation in early 2003, CPHLN has facilitated the development of standards, protocols, case definitions and policies, as well as the procurement of equipment for provincial public health laboratories. True to its primary purpose, CPHLN has also consistently demonstrated the power of networks in coordinating laboratory response efforts, most notably during the SARS outbreak in 2003.



A view from the back of NML's Operations Centre, constructed in the very room from which NML coordinated the receipt and testing of over 14,000 possible SARS specimens during the 2003 outbreak.

CSCHAH Community Liaison Committee

The Community Liaison Committee was established in 2000 in response to public concerns about the safety and containment procedures of CSCHAH laboratories. The aim of the Committee is to develop and maintain an atmosphere of trust and confidence between CSCHAH and the community, by providing an ongoing forum for dialogue and information exchange.

Comprised of volunteer members representing a range of community interests (e.g., local residents, the Government of Manitoba, the City of Winnipeg, the medical community, the agricultural community, the academic community), the Community Liaison Committee secures and disseminates accurate information to foster greater understanding of the activities of CSCHAH. The Committee also monitors safety issues for the benefit of the community and CSCHAH staff. In addition, in the spring of 2005, the Committee began holding annual public meetings to provide all residents with an opportunity to raise concerns and ask questions.

The CSCHAH approach to community relations, in particular the creation and successful operation of the Community Liaison Committee, has been applauded and emulated by laboratories in other countries.

Moving Forward, Reaching Farther

Looking back, NML can indeed claim a rich history of achievement. However, only by continually moving forward and reaching farther, can NML maintain and build on its impressive record.

With every gain in the global fight against infectious disease, the environment in which these organisms live and thrive provides continuous challenges. Diseases previously thought to be eliminated are returning, and an increasing number of bacteria are growing resistant to treatment. Meanwhile, modern medicine is contending with the rapid emergence of new diseases and the spread of diseases that are transmitted from animals to humans.

In anticipation of constant change in the public health landscape, and consistent with Branch and Agency direction, NML recently completed a multi-year strategic plan. The following strategic priorities were established to guide the national laboratory in fulfilling its potential as a pillar of the Public Health Agency of Canada and principal partner in global infectious disease control.

NML Team - become the Canadian and International laboratory of choice for research scientists, post-doctoral fellows and graduate students, as well as non-scientific employees pursuing a career in public health.

International Presence - strengthen NML's ties with international partners and its presence in international communities, to foster mutual sharing, support and recognition.

Role in Outbreak Response - improve emergency preparedness and outbreak response capabilities within the laboratory and at the national level.

Contribution to Innovation - develop and transfer knowledge and tools to support the individual and collective efforts of NML's public health partners in preventing and controlling the spread of infectious disease.

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

For each priority area, specific objectives have been identified and incorporated into individual program and laboratory-wide business, operational and financial plans and activities. Within a year of its development, many of the ideas put forward in the NML strategic plan are being implemented; some are reflected in the pages of this report.

NML is poised to meet the challenges and opportunities ahead, and to fulfill its role as Canada's "go to" laboratory for infectious disease diagnosis, research and outbreak response. NML will continue to monitor changes in the national and global public health environment, evaluate its performance in relation to PHAC and stakeholder priorities, and revisit its future direction to ensure the achievement of its vision and mission and, in turn, the health and safety of Canadians.

