20th Century Gains Against Infectious Diseases
Emerging and Remerging Infectious Diseases

- Emerging infections are those that are new or newly discovered in humans – mainly come from animals (measles, plague, tuberculosis, influenza, HIV, SARS)
- Infections re-emerge when old microbial foes acquire new weapons through genetic exchange or mutation – resistance to drugs or vaccines, escape from the human immune defences
The Katrina Lesson
Role of the National Microbiology Laboratory
The Vision for the “Lab”

- Build on microbiology and infectious disease strength in Winnipeg
- Create a world class Canadian center for infectious diseases and microbiology research
- Provide outstanding training environment for microbiology and infectious diseases
- Attract new investment to Manitoba and Canada
One Facility: Two Labs

- The Public Health Agency of Canada’s National Microbiology Laboratory (NML)
- The Canadian Food Inspection Agency’s National Centre for Foreign Animal Disease (NCFAD)
NML is a world class organization, using cutting edge science in support of its unique national public health role.

- Surveillance for infectious diseases
- Reference microbiology and quality assurance
- Biologic threats preparedness and response
- Applied and fundamental research
# NML Programming

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**Business and Laboratory Support Programs**
Strategy In Realizing The Vision

• Manage the lab as a national and international science resource
• Promote and foster excellence
• Network, partner, collaborate and integrate
• Build unique national science platforms
NML-NCFAD Staffing

- Scientific
- All staff


Staffing Levels:
- Scientific: 0, 50, 100, 150, 200, 250, 300, 350, 400, 450
- All staff: 50, 100, 150, 200, 250, 300, 350, 400, 450, 500
NML Students

- Post-doctoral fellows
- Graduate Students
- Co-operative
- FSWEP

Year:
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
Post SARS Threats Requiring PHAC Response

- Laboratory and restaurant associated SARS
- Nipah epidemic in Bangladesh
- Hamster tularemia
- Marburg virus in Angola
- H7N3 Avian influenza in BC
- H5N1 Avian influenza in Vietnam and SE Asia
- H2N2 influenza distributed by CAP
- Pandemic influenza
- *Clostridium difficile* colitis

- Community acquired MRSA
- LGV proctitis in gay men
- Rubella outbreak in Ontario
- Increasing rates of STD
- Group B meningococcal disease
- Cyclospora outbreaks
- *E. coli* H7:O157 outbreak
- Norovirus outbreaks
- West Nile virus
New Threats Are Global

- Marburg
- Rubella
- LGV
- Avian Influenza
- CA-MRSA
- Influenza Pandemic

Lymphogranuloma Venereum alert: two MSM cases in Ontario

150 cases of rubella

Mask and goggles mandatory

You must declare all poultry meat, poultry products, feathers, eggs or egg products to a Quarantine Officer.
Microbiologic Emergency Response Teams

Use of portable CL3 units to create safe work environment

• isolator for basic microbiology
• isolator for specialized techniques
• equipment needed to perform testing
Critical Operations
- Canadian Laboratory Surveillance -

Canadian Laboratory Surveillance Network

Laboratory Standardization Subcommittee

Molecular Diagnostics Working Group

Laboratory Surveillance Operations for:

- E. coli
- Salmonella spp.
- Shigella
- Campy, Listeria
- C. diff, MRSA
- Norovirus
- Influenzae

Molecular Epidemiology
How does it work?

PFGE tiff file

Patterns entered into Bionumerics and analyzed

Each lab analyzes the image and replies to listserv:
Any pattern matches?
Any known sources of infection?
What is known about the pattern?

Clusters identified
Is this a new pattern?
Is this a common pattern?
Patterns designated

Dendrogram created in Bionumerics
Research and Innovation

- Portfolio of 25 patents and preliminary patents
- Vaccines
- Antibody epitopes
- Immunotherapeutics and immunoprophylactics
- Diagnostics
- Public health IT tools
Viral Hemorrhagic Fevers

The Agents
- Ebola
- Marburg
- Lassa
- CCHF
- Machupo

Characteristics
- zoonotic
- mortality as high as 80%
- no treatment, no vaccines
- “A list” of bioterrorism threats
Ebola Vaccine Efficacy

- Uses a Vesicular Stomatitis Virus to deliver Ebola virus genes.
- Also effective in non-human primates.
- Exciting potential
Canadian Network for Public Health Intelligence

- A key lesson from SARS was the importance of real time surveillance and alerting
- Through a CRTI project PHAC-NML has developed a suite of tools (CNPHI) which provides this capability
Canadian Integrated Outbreak Surveillance Centre (CIOSC)
Public Health Alerts

December 2004

Alert Modules
- Enteric (launch Apr 2001)
- Respiratory (launch Dec 2004)
- Travel (launch Apr 2005)
- Zoonotic (launch Apr 2005)
- General* (launch Apr 2005)
- First Responder (proposed)

Provincial/Territorial Authorities

Public Health Agency of Canada

Other Federal Agencies

CDC
Epi-X

Regional Health Authorities

First Responders
-FNHB health care professionals
- Custom Officers
- Others
- ER physicians
- General practitioners
- Military
- Law Enforcement
- Laboratorians
- Paramedics
- Veterinarians
- Social Workers
- Nurses

- Targeted alerting
- Role based
- Respect jurisdictional accountabilities
- Program driven
- Configurable & flexible
- Secure web-technology

Phone
Email
Fax
Pager

2005

*General Alerts will accommodate disease areas not specifically addressed in other modules until program areas define disease specific user requirements
NML Roles

**Domestic**
- Planning
- Monitoring the global situation
- Alert systems – GPHIN, CNPHI
- Surveillance
- Laboratory research
- Vaccine development

**Multilateral**
- WHO participation
- Global Health Security Action Group
- Response through GOARN to outbreaks (SARS, Avian influenza, Ebola, Nipah)

**Bilateral**
- Field research (Kenya, Bolivia, Iran, Vietnam)
- Public health capacity building through training
Conclusion

- NML is at the cutting edge of science in infectious diseases
- NML is responsible for a number of significant public health innovations.
- It has taken its place as one of the elite public health laboratories in the world.
- Maintaining this position will be a constant challenge.