Vaccine Development in Canada

Research Canada
Health Research Caucus Luncheon

Paul D. Hodgson
Associate Director
VIDO-InterVac
paul.hodgson@usask.ca
Outline

• Overview of ID
• Some Canadian context re: vaccines
• Current infrastructure
• Some general thoughts
Infectious Diseases are Deadly

- Children from developing nations have a 10-fold greater chance of dying of a vaccine-preventable disease.
- HIV/AIDS, diarrhoeal diseases, malaria and tuberculosis account for approximately 1/3 of deaths in developing nations.
- Over 50% of deaths in children under 5 are due to infectious disease.
Infectious Diseases Spread Easily

• Canadians remain at risk
Infectious Diseases are Costly

- SARS: WHO travel advisory
- Hepatitis C: costs Canada about $1 billion/yr
- HIV: NPV of ~$250k/infected Canadian
- Influenza (US~$10B in direct medical costs)
- Zoonotic & foodborne diseases
Some ID have a ‘solution’...

- Jenner’s smallpox vaccine 1797
  – Intranasal smallpox vaccine in China 1022AD
- Vaccines saved more lives worldwide than any other medical intervention
- Vaccines are the most cost-effective way of controlling infectious disease to date
- Vaccines protect more than individuals; it protects entire populations
- Our population is aging
# Vaccines Protect Canadians

## Preventable Disease

<table>
<thead>
<tr>
<th>Disease</th>
<th>Pre-Vaccine Peak Cases</th>
<th>Peak Cases 2007-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphtheria</td>
<td>9,010</td>
<td>4</td>
</tr>
<tr>
<td>Hib</td>
<td>526</td>
<td>12</td>
</tr>
<tr>
<td>Measles</td>
<td>61,370</td>
<td>750</td>
</tr>
<tr>
<td>Mumps</td>
<td>43,671</td>
<td>1,110</td>
</tr>
<tr>
<td>Whooping cough</td>
<td>19,878</td>
<td>1,967</td>
</tr>
<tr>
<td>Poliomyelitis</td>
<td>1,584</td>
<td>0</td>
</tr>
<tr>
<td>Rubella</td>
<td>37,917</td>
<td>12</td>
</tr>
<tr>
<td>Tetanus</td>
<td>19</td>
<td>6</td>
</tr>
</tbody>
</table>

modified from Chief Public Health Officer’s Report, 2013

## Impact of Vaccines in Canada

![Graph showing the impact of vaccines in Canada](image)
Canada has played a pivotal role in global vaccine development

- **Smallpox:**
  - 1st vaccination in North America in Nfld ~1800
  - Leadership in smallpox eradication (recognized by WHO)

- **Paralytic Polio:**
  - Medium 199 & Toronto Method
  - Large scale production of polio vaccine

- 1st combined vaccine (DPT)
- 1st infant Meningitis C vaccine (NRC)
- 1st zoonotic vaccine (VIDO-InterVac)
- Ebola (NML)
- Many of these historical developments involved Connaught labs
CONNAUGHT ANTITOXIN LABORATORIES
UNIVERSITY OF TORONTO
Established for research investigation in Preventive Medicine and for the production and distribution of all Public Health Biological Products at Minimum Prices.

SERVICE TO THE EMPIRE

VACCINES
For Prevention of
SMALLPOX
TYPHOID FEVER
WHOOPING COUGH
HYDROPHOBIA

SERUMS
For Prevention or Cure of
DIPHTHERIA
LOCKJAW (TETANUS)
PNEUMONIA (CERTAIN CASES)
EPIDEMIC MENINGITIS

This map shows the success of the effort to prepare and distribute these life-saving products at minimum prices.

BY THE UNIVERSITY OF TORONTO.
The ‘easy diseases’ are done
Emerging diseases and several known diseases are proving challenging
Most of the emerging diseases require special infrastructure – CL3
Challenge: money less important when you are sick, current vaccines are preventative
Need to improve on the translational aspects of vaccine development
• A not-for-profit corporation - funding from NCE CECR
• Goal to help with translation/accelerate vaccines to the marketplace
• 3 nodes: BC, SK, NS
• Currently 5 vaccine candidates in the pipeline
The Vaccine and Infectious Disease Organization – International Vaccine Centre
VIDO-InterVac

• 165 personnel
• ISO9001 Certified
• Expertise in large animal models of disease
• 8 commercialized vaccines; 6 world firsts
• >$200 million in state-of-the-art infrastructure

• CL2 (VIDO)
  – ~100,000 ft² of labs + 20,000 ft² animal isolation
  – 160 acre research station

• CL3 (InterVac)
  – 150,000 ft² (~13 hockey rinks)
  – 18 animal holding rooms; 6 laboratories
  – Select agent lab
  – Aerobiology challenge capability (e.g., Flu, TB)
Officially ‘hot’
Summary

• Canadians should be proud of our role in international vaccine development
• Our scientific personnel for vaccine research and discovery are world class; but…
• Infrastructure including manufacturing capacity is fundamental
• Continued research and development remains essential to tackling new diseases
• Consider vaccines as a cost saver to public health and convince modern society to invest in prevention

IF YOU THINK RESEARCH IS EXPENSIVE YOU SHOULD TRY DISEASE
Saskatchewan:
Land of the living skies