History and aims of immunisation

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Objectives

- To examine the history of immunisation
- To explain the aim of immunisation
- To develop an understanding of the role of the following agencies in relation to immunisation
  - The National Immunisation Advisory Committee (NIAC)
  - The Department of Health (DoH)
  - The Health Service Executive (HSE)
  - The National Immunisation Office (NIO)
  - The Health Protection Surveillance Centre (HPSC)
- To understand the importance of infectious disease surveillance in Ireland
Smallpox

Variola virus

Infected humans 10,000 years ago

Known in China 11th century BC

Inoculation described 6th century BC

1796 vaccinia virus isolated

In 1798 Jenner showed that inoculation with cowpox virus produced protection against smallpox.

Edward Jenner (1749 – 1823)
Smallpox

1977 Last reported case Somalia

1980 WHO declared eradication

CDC. Public Health Images Library (PHIL) id# 131. Source: CDC/Barbra Rice

www.immunisation.ie
## The Development of Human Vaccines

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smallpox</td>
<td>1798</td>
</tr>
<tr>
<td>Rabies</td>
<td>1885</td>
</tr>
<tr>
<td>Typhoid</td>
<td>1896</td>
</tr>
<tr>
<td>Cholera</td>
<td>1896</td>
</tr>
<tr>
<td>Plague</td>
<td>1897</td>
</tr>
<tr>
<td>Diphtheria</td>
<td>1923</td>
</tr>
<tr>
<td>Pertussis</td>
<td>1926</td>
</tr>
<tr>
<td>BCG (Tuberculosis)</td>
<td>1927</td>
</tr>
<tr>
<td>Tetanus</td>
<td>1927</td>
</tr>
<tr>
<td>Yellow Fever</td>
<td>1935</td>
</tr>
<tr>
<td>Influenza</td>
<td>1936</td>
</tr>
<tr>
<td>Polio (IPV)</td>
<td>1955</td>
</tr>
<tr>
<td>Polio (OPV)</td>
<td>1962</td>
</tr>
<tr>
<td>Measles</td>
<td>1964</td>
</tr>
<tr>
<td>Mumps</td>
<td>1967</td>
</tr>
<tr>
<td>Rubella</td>
<td>1970</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>1981</td>
</tr>
</tbody>
</table>
Comparison of annual morbidity from vaccine-preventable diseases during the 20th century and 2010

<table>
<thead>
<tr>
<th>Disease</th>
<th>20th Century*</th>
<th>2010</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphtheria</td>
<td>21,053</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td><em>Haemophilus influenzae</em> type b in children aged &lt;5 yrs.</td>
<td>20,000</td>
<td>240</td>
<td>99</td>
</tr>
<tr>
<td>Measles</td>
<td>530,217</td>
<td>63</td>
<td>&gt;99</td>
</tr>
<tr>
<td>Mumps</td>
<td>162,344</td>
<td>2,612</td>
<td>98</td>
</tr>
<tr>
<td>Pertussis</td>
<td>200,752</td>
<td>27,538</td>
<td>86</td>
</tr>
<tr>
<td>Poliomyelitis, paralytic</td>
<td>16,316</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Rubella</td>
<td>47,745</td>
<td>5</td>
<td>&gt;99</td>
</tr>
<tr>
<td>Congenital rubella syndrome</td>
<td>152</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Smallpox</td>
<td>29,005</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Tetanus</td>
<td>580</td>
<td>26</td>
<td>96</td>
</tr>
</tbody>
</table>
Aim of Immunisation

- The aim of immunisation is the prevention of disease in individuals or groups.

- Examples
  - 1980 elimination of smallpox (WHO)
  - 1991-Elimination of polio from the Americas

- Achieved by
  - a comprehensive immunisation programme achieving the World Health Organisation target uptake of 95% for childhood vaccines and 70% for influenza vaccines
  - intensive surveillance of these diseases
Multidisciplinary components of an immunisation system
The National Immunisation Advisory Committee (NIAC)

- Independent committee of the RCPI
- Variety of experts
- Advises the Department of Health
- Produces the National Immunisation Guidelines for Ireland
  Based on
  - best evidence regarding the safety and efficacy of vaccines
  - the disease burden
  - pharmacoeconomic analyses
The Department of Health (DoH)

- Responsible for making policy decisions regarding the immunisation programme including changes to the current immunisation programme.

The Irish Medicines Board

- Regulatory body responsible for licensing of vaccines and ensuring their quality and safety and efficacy
- Responsible for monitoring and evaluation of adverse events following immunisation
HSE

- Responsible for the implementation of the primary childhood, school immunisation and seasonal influenza vaccination programmes
- Delivered by general practitioners (GPs), practice nurses, community health doctors and public health nurses and support staff
Coordinating Unit

- Standardised implementation of all publicly funded immunisation programmes
- Protocols and immunisation training
- Information materials for the general public
- National immunisation website www.immunisation.ie
- Vaccine contracts and the HSE National Cold Chain delivery Service to provide vaccine deliveries to all GPs, hospitals and HSE clinics
- Development of a national IT database
  - Currently different IT systems modified with any changes to schedule
Health Protection Surveillance Centre (HPSC)

- Responsible for surveillance of vaccine preventable diseases
- Monitors immunisation uptake data from each HSE area and reports on uptake rates
- HPSC website [www.hpsc.ie](http://www.hpsc.ie)
Infectious Disease Surveillance

- Public health surveillance is the systematic collection, collation, analysis and dissemination of data so that action can be taken.
Importance of surveillance

- Monitor the epidemiology of the disease. Epidemiology can be defined as the study of the distribution and determinants of disease (who, where, when and how) in different populations.

- Monitor trends in disease incidence.

- Detect outbreaks and enable effective control mechanisms to be put in place.

- Monitor the effectiveness of interventions and evaluate programmes.

- Identify high risk groups and risk factors.

- Identify gaps in existing services and set priorities for allocation of resources.

- Facilitate research.
Importance of surveillance-Hib

- Hib vaccine, 1992
- Hib catch-up, 2005
- Hib booster, 2006
Measles Event by week 2010-2011

Health Protection Surveillance Centre
Measles cases, week 1 - 44, HSE-E, 2011
(N = 242)

7 of 12 in same crèche cluster

T of 12 in same crèche cluster

August

October

Week number 2011
Vaccine Uptake Rates at 24 months 1999-2011
Quarter 2 2011 D3 Immunisation Rates at 24 months Ireland and Dublin
Quarter 2 2011 MMR Immunisation Rates at 24 months Ireland and Dublin
Why Immunise?

- Immunisation is one of the most cost effective and safest of all health interventions.

- Immunisation has saved more lives than any other public health intervention apart from the provision of clean water.
Immunisation Successes

- Meningococcal C Campaign (Reduced incidence of cases by 90% since October 2000)
- Eradication of smallpox
- ? Near eradication of poliomyelitis
- Control of others, e.g. Hib, diphtheria, pertussis
- Successful immunisation - more attention to vaccine related illness
Thanks to NIO and HPSC for data