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Chapter 1

History and Aims of Immunisation

1.1 Objectives:

- To explain the aim of immunisation
- To examine the history 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 and Children (DoHC)
 - 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

1.2 Aim of immunisation

The aim of immunisation is the prevention of disease in individuals or groups. The World Health Organisation (WHO) announced the global elimination of smallpox in 1980 and in 1991 announced the elimination of poliomyelitis from the Americas. These achievements were only possible through provision of a comprehensive immunisation programme providing high levels of vaccine coverage combined with intensive surveillance of these diseases.

1.3 History of immunisation

In 1798 Edward Jenner showed that inoculation with cowpox virus produced protection against smallpox. He called the inoculation material “vaccine” from the Latin word for cow “vacca”, giving birth to the process of vaccination. The initial response to vaccination was positive, but its popularity declined due to problems with unintended transmission of infections and failure to induce immunity. During the period 1860-1890 Louis Pasteur produced vaccines against chickenpox, cholera, diphtheria, anthrax and rabies.

The first toxoid vaccines against diphtheria and tetanus were produced early in the 20th Century, following the discovery of how to inactivate toxins using formalin. Other vaccines quickly followed for tuberculosis, yellow fever, pertussis and influenza.

The new technique of growing viruses in cell culture made further major advances possible post-World War II. Since then, more vaccines have been developed using new technologies such as genetically engineered vaccines.

Vaccine development proceeds through discovery, process engineering, toxicology and animal studies to human Phase I, II, and III trials. The process of developing a vaccine can take more than 10 years.

Phase I trials focus initially on safety, involving small groups of people (fewer than 100).

Phase II trials progress to moderate-sized “target” populations (100-1,000) who are close in age and other characteristics to intended vaccine recipients. Phase II trials are used to determine vaccine safety and the immune system response.

Phase III trials provide a more complete assessment of safety and effectiveness and focus on large target populations (1,000-10,000+) to establish whether a vaccine actually prevents a disease as intended (efficacy).

Combined vaccines such as MMR vaccine, pentavalent and hexavalent vaccines are now available. The production of combination vaccines is not straightforward. Each combination is developed and studied individually in terms of quality, safety and efficacy. This includes addressing correct formulation, stability and components of the vaccine including preservatives, stabilisers and adjuvants.

The advantage of combination vaccines are that they

- reduce the number of injections given to the client
- reduce the number of client visits
- reduce the level of distress to parent and child
- increase the likelihood of completion of the vaccination course.

The following table outlines the year of first usage of some vaccines

Table 1.1: Vaccines by year of first usage

Vaccine	Year
Smallpox	1798
Rabies	1885
Typhoid	1896
Cholera	1896
Plague	1897
Diphtheria	1923
Pertussis	1926
BCG (Tuberculosis)	1927
Tetanus	1927
Yellow Fever	1935
Influenza	1936
Polio (IPV)	1955
Polio (OPV)	1962
Measles	1964
Mumps	1967
Rubella	1970
Hepatitis B	1981

1.4 Roles of agencies involved in the immunisation programme.

A multidisciplinary, integrated approach is required in order to deliver an effective immunisation programme. The main partners in the delivery of immunisation services are outlined in Appendix 1 and include:

1.4.1 The National Immunisation Advisory Committee

The National Immunisation Advisory Committee (NIAC) is an independent advisory committee of the Royal College of Physicians of Ireland comprising experts in the fields of paediatrics, infectious diseases, general practice, public health and occupational health who examine disease epidemiology and international best practice in relation to immunisation. NIAC is responsible for producing National Immunisation Guidelines for Ireland and advises the Department of Health and Children on immunisation policy.

1.4.2 The Department of Health and Children

The Department of Health and Children (DoHC) is responsible for making policy decisions regarding the immunisation programme. This includes making decisions about changes to the current immunisation programme. Decisions to change the programme are made on the basis of

- Epidemiology of the disease
- The availability of an effective safe vaccine
- Cost effectiveness of the programme
- An infrastructure to deliver the programme.

In 2007, the Department of Health and Children set up a "Vaccine Damage Steering Committee" to examine the issue of vaccine damage and compensation. This committee will define the serious adverse events following immunisation with vaccines recommended by the National Immunisation

Advisory Committee, and consider a compensation package for those deemed to have suffered serious adverse events as a consequence of immunisation.

1.4.3 The Health Service Executive

The Health Service Executive (HSE) was established on January 1st 2005 to deliver a unified health service in Ireland and has operational responsibility for the running of the health services in Ireland. Prior to this, services were delivered through a complex structure of ten regional Health Boards, the Eastern Regional Health Authority and a number of other different agencies and organisations. The HSE replaces all of these organisations. It is now the single body responsible for ensuring that everybody can access cost effective and consistently high quality health and personal social services.

1.4.4 The National Immunisation Office

The National Immunisation Office (NIO) is a unit within the Directorate of Population Health of HSE. The NIO coordinates with colleagues in the Primary, Community and Continuing Care (PCCC) directorate of the HSE in the delivery of the immunisation programme. The PCCC directorate is responsible for the implementation of the primary childhood immunisation programme which is delivered by general practitioners (GPs), practice nurses, community health doctors and public health nurses and support staff.

The responsibilities of the NIO include

- Overseeing the day-to-day implementation of the National Immunisation Programme
- Planning and implementation of new immunisation programmes
- Organisation of campaigns to boost vaccine uptake
- Development and provision of up-to-date information leaflets for parents and healthcare professionals
- Development and provision of immunisation training material
- Managing the HSE National Cold Chain delivery Service which delivers vaccines under temperature controlled conditions to GPs, hospitals and health centres
- Managing the vaccine supply chain (procurement and distribution)
- Development of a National Immunisation Information Technology database
- Maintaining the National Immunisation Website www.immunisation.ie
- Working in partnership with all relevant stakeholders.

1.4.5 Health Protection Surveillance Centre

The Health Protection Surveillance Centre (HPSC) formerly known as the National Disease Surveillance Centre (NDSC) was established in 1998 and is now part of the HSE. The aim of HPSC is to improve the health of the Irish population by collating, interpreting and disseminating data in order to provide the best possible information on infectious disease. This is achieved through surveillance and independent advice, epidemiological investigation, research and training. The HPSC works in partnership with health service providers and sister organisations around the world, to provide up-to-date information for the effective control of infectious diseases. The notification process and a listing of notifiable vaccine-preventable diseases are outlined in Appendix 2. Further information is available on the HPSC website www.hpsc.ie

1.5 Infectious disease surveillance

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

Surveillance of infectious disease is important as it allows us to

- 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.

The importance of surveillance in Ireland was highlighted in 2005 when the HPSC showed that there was an increase in Haemophilus influenzae type b (Hib) disease in young infants who had previously been vaccinated with three doses of Hib vaccine (vaccine failures). This led to the introduction of a Hib booster catch-up campaign for those children aged between one and four years in November 2005. In September 2006 a Hib booster was added to the National Immunisation Schedule.

1.6 Monitoring immunisation uptake

The Health Protection Surveillance Centre receives immunisation uptake data from each HSE area and reports on uptake rates nationally, by HSE Area and by Local Health Office area. These reports are published each quarter on their website <http://www.ndsc.ie/hpsc/A-Z/VaccinePreventable/Vaccination/>.

1.7 Useful Resources

American Academy of Paediatrics. 2006 Report of the Committee on Infectious Diseases – The Red Book. <http://aapredbook.aappublications.org/>

Australian Immunisation Handbook, Eighth Edition. <http://www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/handbook03>

Canadian Immunisation Guide Seventh Edition 2006. <http://www.phac-aspc.gc.ca/publicat/cig-gci/index.html>

Department of Health and Children Ireland. www.dohc.ie

Department of Health UK. November 2006. Immunisation against infectious disease. http://www.dh.gov.uk/en/Policyandguidance/Healthandsocialcaretopics/Greenbook/DH_4097254

Ellman D, Bedford H. Safety and efficacy of combination vaccines. BMJ 2003 (326) 995-996

Health Protection Surveillance Centre, Ireland. www.hpsc.ie

National Immunisation Office, Health Service Executive, Ireland. <http://www.immunisation.ie>.

Minister for Health New Zealand: Immunisation Handbook 2006. www.moh.govt.nz/immunisation

Royal College of Physicians of Ireland. Immunisation Guidelines for Ireland. Available at www.hpsc.ie

World Health Organisation. <http://www.who.int/en/>

