A Short Historical Perspective on Immunization

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Readings

- Plotkin’s Vaccines

- Immunology

- Posted articles
Historical Perspective

• “Ancient Times”, the Balochi people
  - encouraged children with wounds on their hands to touch skin lesions of cow and camelpox

• “Centuries ago” Variolation in India & China?
  - inoculation of fluid or scabs from smallpox lesions into skin or intranasally of smallpox-susceptibles
  - usually mild illness, occasionally severe disease with spread to others

• 11\textsuperscript{th} century, Iran
  - applied dried liver/ rabid dog on wound of bitten person
1721, Lady Mary Montague: observed variolation in Turkey & promoted its use in Europe

1774, Benjamin Jesty's tombstone: To the Memory of Benjamin Jesty (of Downshay) who departed this Life, April 16th 1816 aged 79 Years. He was born at Yetminster in this County, and was an upright honest Man; particularly noted for having been the first Person (known) that Introduced the Cow Pox by Inoculation, and who from his great strength of mind made the Experiment from the Cow on his Wife and two Sons in the Year 1774.
Historical Perspective

1796, Sir Edward Jenner
- milkmaids who had cowpox (vaccinia?) were immune to smallpox
- inoculated fluid from cowpox lesions into the skin of smallpox susceptible people (calf lymph-derived vaccinia virus)
  • “1st” documented use of a less virulent related species to protect against an exclusively human pathogen
Historical Perspective

- 1886, Salmon/Smith: killed hog cholera “virus” vaccine (salmonella)
  - led to killed vaccines for typhoid, cholera & plague
- 1909, Smith: inactivated diphtheria toxin (toxoid) protects guinea pigs
  - led to diphtheria & tetanus toxoid vaccines for humans
- 1927, Bacillus of Calmette & Guerin (BCG)
  - attenuated by passage in beef bile over 13 years of Mycobacterium bovis
- 1931, Goodpasture: chorioallantoic membrane/hen’s egg
  - safe, reliable method for growing viruses for vaccines
- 1937, Live attenuated yellow fever vaccine
  - passage in mouse brain & chorioallantoic membrane/hen’s egg (17D strain)
- 1955, Salk: formalin-inactivated polio vaccine (IPV)
- 1962, Sabin: Live attenuated polio vaccine (OPV, TOPV)
Historical Perspective

• 1885: Louis Pasteur vaccinates Joseph Meister with rabies vaccine
  - Air-dried infected rabbit spinal cord:
    • started with avirulent virus, then proceeded with a series of more virulent strains
  - Coins “vaccination” in honor of Jenner

• 1955, Jonas Salk, senior:
  - formalin-inactivated polio vaccine (IPV)

• 1962, Albert Sabin:
  - live attenuated polio vaccine (OPV, TOPV)
Modern Vaccine Development Timeline: 1955 - 1989

- Inactivated Polio Vaccine → 1955
- Cutter incident: 40,000 Polio cases

- Monovalent Live Polio Vaccine → 1961
- 1963

- Trivalent Live Polio Vaccine → 1963
- 20,000 cases of Congenital Rubella Syndrome

- 1st Measles Vaccine → 1964-5
- Mumps Vaccine → 1967
- Rubella Vaccine → 1969

- Measles/Mumps/Rubella Vaccine → 1971
- Routine Smallpox Vaccination ended in the USA
- 1976
- Swine Flu Vaccination is halted due to concerns about Guillain-Barré syndrome

- 1977
- Last worldwide indigenous case of smallpox seen in Somalia

- 1979
- Last case of wild type polio is acquired in the United States.

- 1st Hepatitis B vaccine → 1982

- National Childhood Injury Act → 1986
- Vaccine Injury Compensation Board

- Worldwide Polio Eradication Initiative → 1988
- Resurgence of Measles in the USA

- 2 dose Measles Vaccine Schedule → 1989

1990
- H. Influenzae b Conjugate Vaccine
- Vaccine Adverse Events Reporting System (VAERS)

1991
- Routine Hepatitis B Vaccination

1994
- The Americas certified as polio free
- 1st Harmonized Childhood Schedule
- Varicella Vaccine
- Hepatitis A Vaccine
- Acellular Pertussis Vaccine

1995
- 1st Harmonized Childhood Schedule
- Varicella Vaccine
- Hepatitis A Vaccine
- Acellular Pertussis Vaccine

1996
- 1st Rotavirus Vaccine
- FDA Recommends removal of Thimerosal from all childhood vaccines

1999
- 1st Rotavirus Vaccine withdrawn due to concerns over intussusception
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2000
- Worldwide Measles initiative started
- Pneumococcal Conjugate Vaccine recommended for all children

2003
- Measles is no longer endemic in the Americas
- 1st Live Attenuated Influenza Vaccine

2004
- Inactivated Flu Vaccine recommended for all children 6-23 months of age

2005
- Meningococcal Conjugate, MMRV, & 1st DTaP vaccines
- Rotavirus, HPV, Zoster vaccines

2006
- Rubella no longer endemic in the USA
- 1st Avian Flu vaccine
Modern Vaccine Development Timeline: 2008–present

- **2008**: DTaP–IPV
- **2009**: HPV–2 (Human Papilloma Virus 16 & 18)
- **2010**:
  - MCV4 (Menveo: meningococcal groups A, C, Y, W–135 oligosaccharides–Diphtheria CRM197 Conjugate Vaccine)
  - PCV13 (Pneumococcal Conjugate Vaccine, 13 serotypes)
- **2014**: HPV–9
- **2015**: Malaria (RTS,S/AS01)
- **2019**: Ebola vaccines (rVSV–ZEBOV & Ad26.ZEBOV/MVA–BN–Filo………)
- **2019**: COVID–19 vaccines