A Short Historical Perspective on Immunization
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Course Number PB-VI01P: Development of a Vaccine During a Pandemic
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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

• 11th 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 Benj.in. 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
- Trivalent Live Polio Vaccine -> 1963
- 1st Measles Vaccine -> 1964-5
- Mumps Vaccine -> 1967
- Rubella Vaccine -> 1969
- Measles/Mumps/Rubella Vaccine -> 1971  <- 20,000 cases of Congenital Rubella Syndrome
- 1st Hepatitis B vaccine 1982
- National Childhood Injury Act 1982
- Worldwide Polio Eradication Initiative 1988
- 2 dose Measles Vaccine Schedule 1989  <- Resurgence of Measles in the USA
- Swine Flu Vaccination is halted due to concerns about Guillain-Barré syndrome 1976
- Routine Smallpox Vaccination ended in the USA 1977  <- Last worldwide indigenous case of smallpox seen in Somalia
- Last case of wild type polio is acquired in the United States. 1979

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

Routine Hepatitis B Vaccination → 1991
Vaccines for Children (VFC) → 1994
1st Harmonized Childhood Schedule → 1995
Varicella Vaccine
Hepatitis A Vaccine
Acellular Pertussis Vaccine → 1996
1st Rotavirus Vaccine → 1998

FDA Recommends removal of Thimerosal from all childhood vaccines → 1999

Worldwide Measles initiative started → 2000
Pneumococcal Conjugate Vaccine recommended for all children
1st Live Attenuated Influenza Vaccine → 2003
1st Adult Immunization schedule
Inactivated Flu Vaccine recommended for all children 6-23 months of age → 2004
Meningococcal Conjugate, MMRV, & 1st DTaP vaccines → 2005
Rotavirus, HPV, Zoster vaccines → 2006
1st Avian Flu vaccine → 2007

← The Americas certified as polio free
← 1st Rotavirus Vaccine withdrawn due to concerns over intussusception
← Measles is no longer endemic in the Americas
← Rubella no longer endemic in the USA
Modern Vaccine Development Timeline: 2008-Present

• 2008: DTaP-IPV

• 2009: HPV-2 (Human Papilloma Virus 16 & 18 Vaccine)

• 2010:
  • MCV4 (Menveo: meningococcal groups A, C, Y, W-135 oligosaccharides-Diphtheria CRM197 Conjugate Vaccine)
  • PCV13 (Pneumococcal Conjugate Vaccine, 13 serotypes)

• 2014: HPV-9