

INTRODUCTION TO MEDICAL MICROBIOLOGY

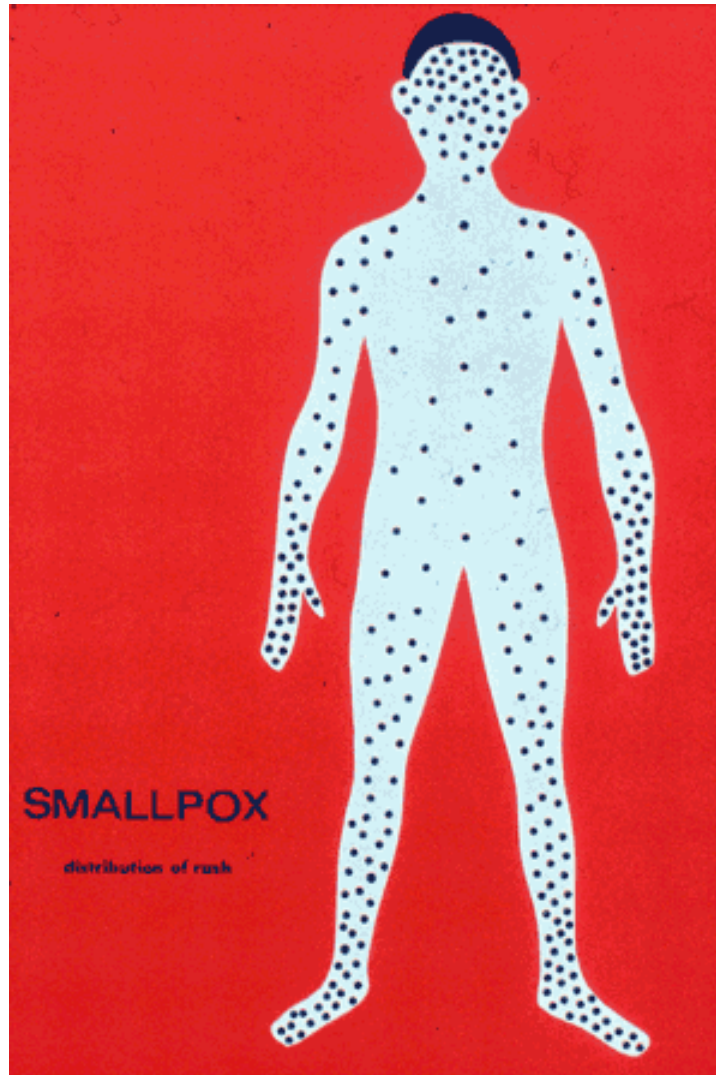
What is microbiology?

- Bacteriology
- Virology
- Mycology
- Immunology
- Genetics

Historical Perspective:

- Hooke – 1665- cells in cork
- Edward Jenner – 1796- First successful vaccination.
 - Smallpox (virus)
 - 30-40% mortality
 - Viremia followed by death
 - Last naturally occurring case in Africa, 1976.
 - Role of WHO in smallpox eradication
 - Possible because humans are the only smallpox host.
 - So, where are we now?
 - Who is immune?
 - Possibility of bioterrorism.
 - Today's plan: Immunize first responders, then public.

SMALLPOX RASH DISTRIBUTION



Schwann – 1839- The Cell Theory

- All organisms are made up of cells
- The cell is the basic organizational unit of life
- Cells cannot arise *de novo*.

Snow – 1853 – First successful epidemiological study.

- Culprit: *Vibrio cholerae*, contaminating a water pump on Broad Street in London. Actual raw sewage into drinking water. Closed down the pump – epidemic over.
- Cholera still responsible for tens of thousands of deaths a year.

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- Van Leeuwenhoek – 1674. Optician, first microscope. Bacteria viewed – *Bacillus anthracis*.

Louis Pasteur

- Redi: 1800. Disproved theory of spontaneous generation which said that living organisms can arise from dead matter, e.g. maggots on dead horseflesh. Said maggots came from eggs of flies, not meat. Still, no one believed him.
- Pasteur: 1861. Figure 1.2. Basically, air contains microorganisms. Made sterile solutions by using cotton plugs. Plug captures bacteria and can then be used to inoculate sterile infusions.
- Also used a swan flask to disprove the “vital force” theory that the infusions themselves had the ability to capture the bacteria.
- 1864 -Pasteurization of wine
- Immunoprophylaxis for rabies
- Described fermentation pathway of sugar to ethanol and carbon dioxide in an anaerobic environment.

Lister – 1867 – Study of childbed fever in a London lying-in hospital.

- Aseptic technique

Koch – 1876- Linked anthrax to a bacterium

– Koch's Postulates:

- Microorganism must be present in every case of the disease
- Organism must be grown in pure culture from the diseased host
- Inoculation of above into host must give same disease
- Organism must be recovered from experimentally infected host

– Also presented methods of obtaining pure cultures

- Gram Stain – 1884
- 1892 - Filterable agent in tobacco mosaic disease
 - a virus

- 1911 – Rous sarcoma virus (a retrovirus) can cause cancer in chickens.
 - Other virus/cancer links:
 - HIV _ Kaposi's sarcoma
 - HPV – Cervical cancer
 - Hepatitis B- Liver cancer

Griffith – 1928 – The Transforming Principle (p. 206)

- Experiment to determine which part of a pneumococcus bacteria caused the disease.
- 1944 – It's the DNA, not the capsule, not the cytoplasm. Provided the groundwork for Avery and McLeod's definitive work, as well as for Watson and Crick

Fleming – 1929 – Penicillin

1953 – Watson, Crick, Franklin, and Wilkins

- The structure of DNA
 - 4 nucleotides : 2 purines (A and G) and 2 pyrimidines (C and T).
- Name origin: (tissue each base was isolated from)
 - Adenine from pancreas
 - Guanine from bird guano
 - Thymine from thymus gland
 - Cytosine from cells
- Base covalently bonded to 5 carbon sugar molecule, which is then bonded to a phosphate molecule