

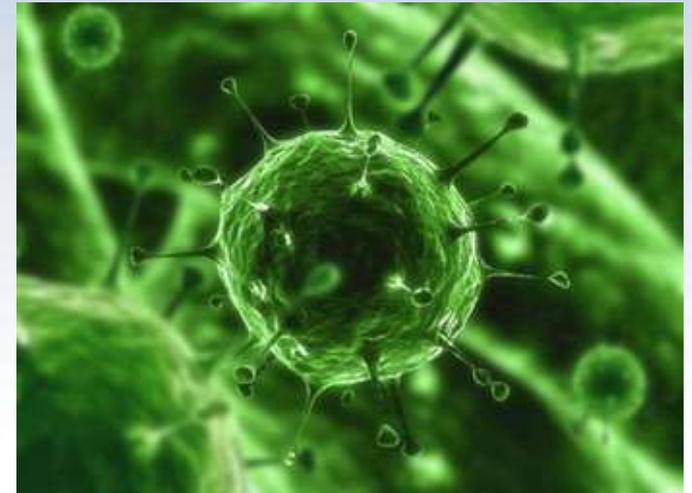
HISTORY OF MICROBIOLOGY

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Batch 4
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Introduction

- Microbiology is the study of organisms that are too small to be seen by the naked eye.
- The microbes have coexisted with humans from the beginning of civilization providing both beneficial and detrimental roles to human life.
- Although not always recognized at the time microbes have dramatically



History – alerting microbes

- History of microbiology starts in the 3rd century BC with Hippocrates recording ideas of infections and diseases
- Malaria – *Plasmodium falciparum*
Mosquito borne infectious disease thought to have killed Alexander the great (323 BC)
- Bubonic plague – *Yersinia pestis*
Caused black death in Europe (1347-1351)
Between 25-40% of Europe died
- Potato blight – *Phytophthora Infestans*
caused Irish potato famine (1845-1849)
potato crops were wiped out

INVENTION OF MICROSCOPE

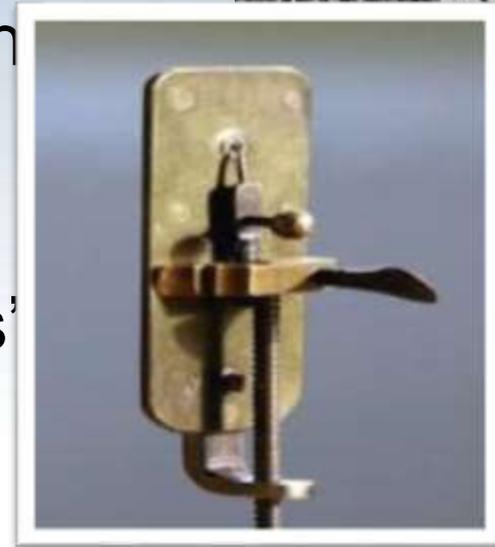
- The science of microbiology started with the invention of the microscope.
- The first reported compound microscope was made by Zacharias Jansen a Dutch spectacle maker.
- One of the first to use a microscope was **Robert Hooke** in 1665. He used the microscope to observe cells.



Anton Von Leeuwenhoek

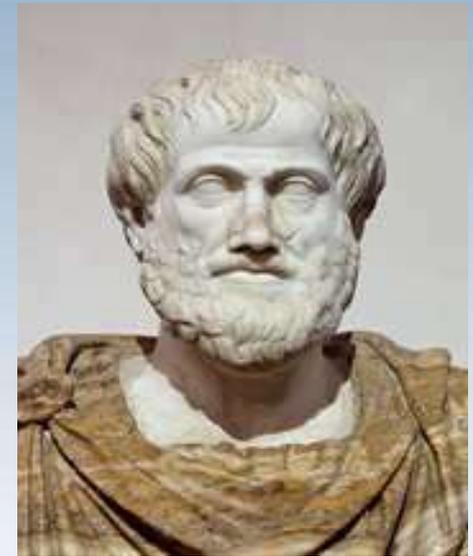


- The first accurate description of microbes was reported in 1674 by Anton von Leeuwenhoek a Dutch lens maker.
- He was the first person to see and describe living microbes.
- He observed and described microorganisms as “Animalcules”



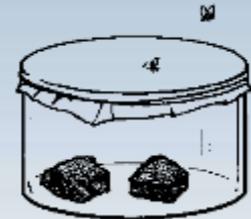
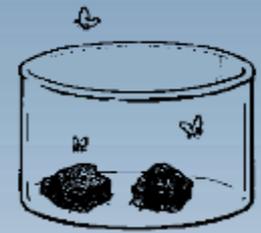
Aristotle

- The belief in the spontaneous generation of life from nonliving matter was introduced by Aristotle, who lived around 350 BC.
- According to Aristotle it was, *"readily observable that aphids arise from the dew which falls on plants, fleas from putrid matter, mice from dirty hay."*
- This belief remained unchallenged for more than 2000



Francesco Redi – Theory of biogenesis

- The spontaneous generation was controverted by Francesco Redi, who showed that fly maggots do not arise from decaying meat if the meat is covered to prevent the entry of flies.
- He disproved spontaneous generation of maggots.
- This arose questions on Aristotle's theory of Abiogenesis.



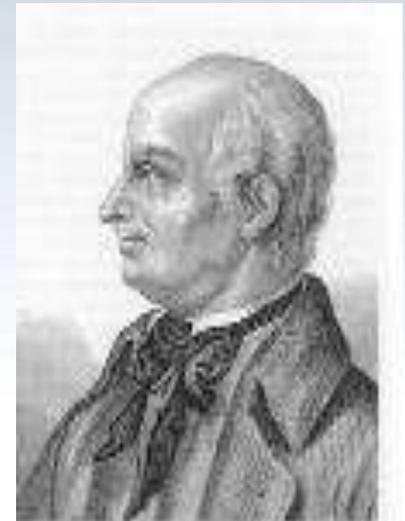
John Needham

- Spontaneous generation for small organisms again gained favor when John Needham showed that if a broth was boiled and then allowed to sit in the open air, it became cloudy

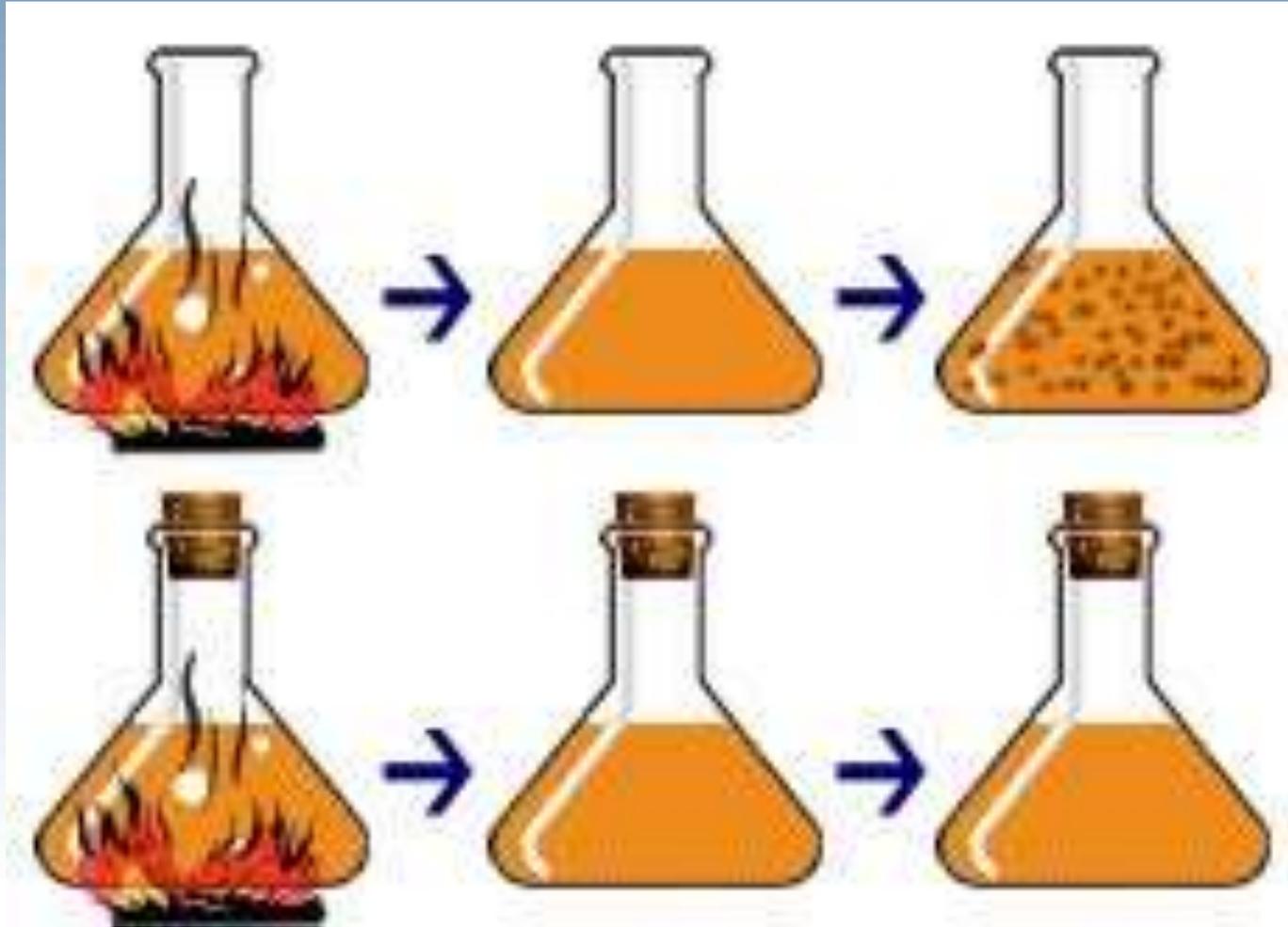


Lazzaro Spallanzani

- Lazzaro Spallanzani disputed the theory by demonstrating the air carrying germs to the culture medium.
- Repeated Needham's experiment in boiled sealed flasks.
- No growth was observed until the flasks were opened.
- Then Spallanzani showed that microbes come from air and that boiling the microbes can kill it.



Needham vs. Lazzaro



Louis Pasteur and the golden era of microbiology

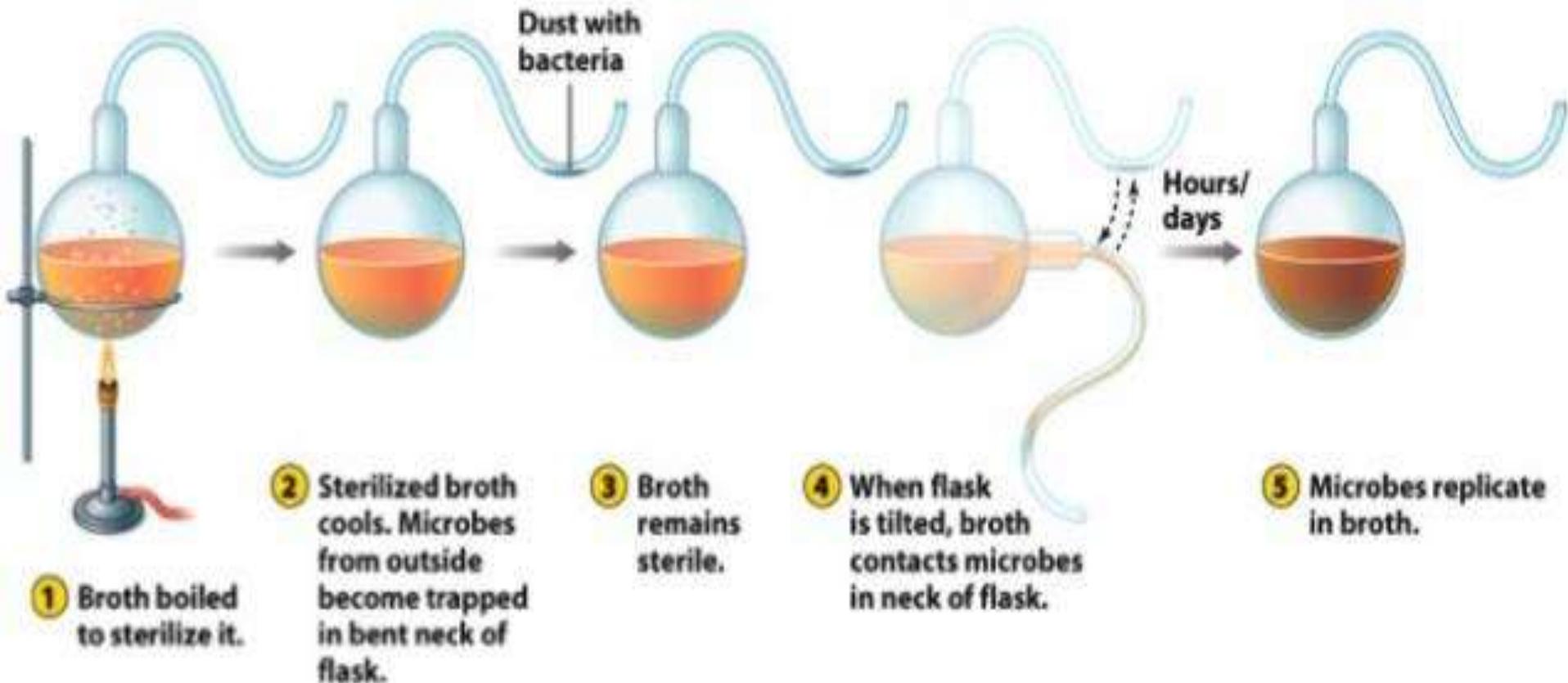
- Louis Pasteur is known as the father of medical microbiology and he worked in the middle and late 1800s.
- He proved that fermentation was caused by microbial agents.
- He exposed boiled broths to the air, in vessels that contained a filter to prevent all particles from passing through to the growth medium, and also in vessels with no filter at all, with air being admitted via a curved tube





- No microorganism was able to grow on the broth during Pasteur's experiment.
- This proved that the living organisms living in that broth came from the outside, as spores on dust, rather than been spontaneously created.
- Louis Pasteur therefore supported the germ theory and he further stated that microorganisms are the causes of infectious diseases.
- He also demonstrated that bacteria could be removed by boiling and then cooling the liquid which gave rise to pasteurisation.

PASTEUR'S EXPERIMENT



Pasteur is well known for his work on,

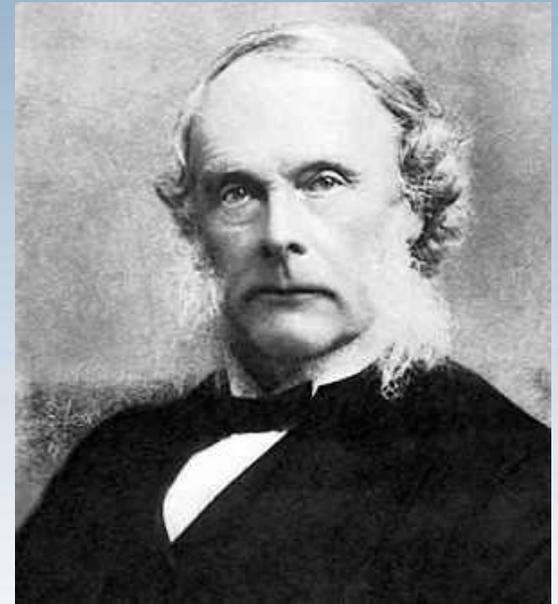
- Proposing germ theory of diseases.
- Development of sterilization techniques.
- Development of methods for growth of microbes.
- Pasteurization.
- Studies on Anthrax, Rabies and cholera.
- A Rabies vaccine and live attenuated Anthrax.



Joseph Lister



- Lord Joseph Lister is known as the father of antiseptic surgery and he proved that wound infections were due to microorganisms.
- He developed a method to destroy microorganisms in the operating theater by spraying a mist of carbolic acid into the air.
- This dramatically reduced the number of people dying due to surgical sepsis.



Robert Koch- Father of Bacteriology



Koch's postulates

Four criteria that were established by Robert Koch to identify the causative agent of a particular disease.

1. The microorganism or other pathogen must be present in all cases of the disease.
2. The pathogen can be isolated from the disease host and grown in pure culture.
3. The pathogen from the pure culture must cause the disease when inoculated into a healthy, susceptible laboratory animal.
4. The pathogen must be reisolated from the new host and shown to be the same as the originally inoculated pathogen.

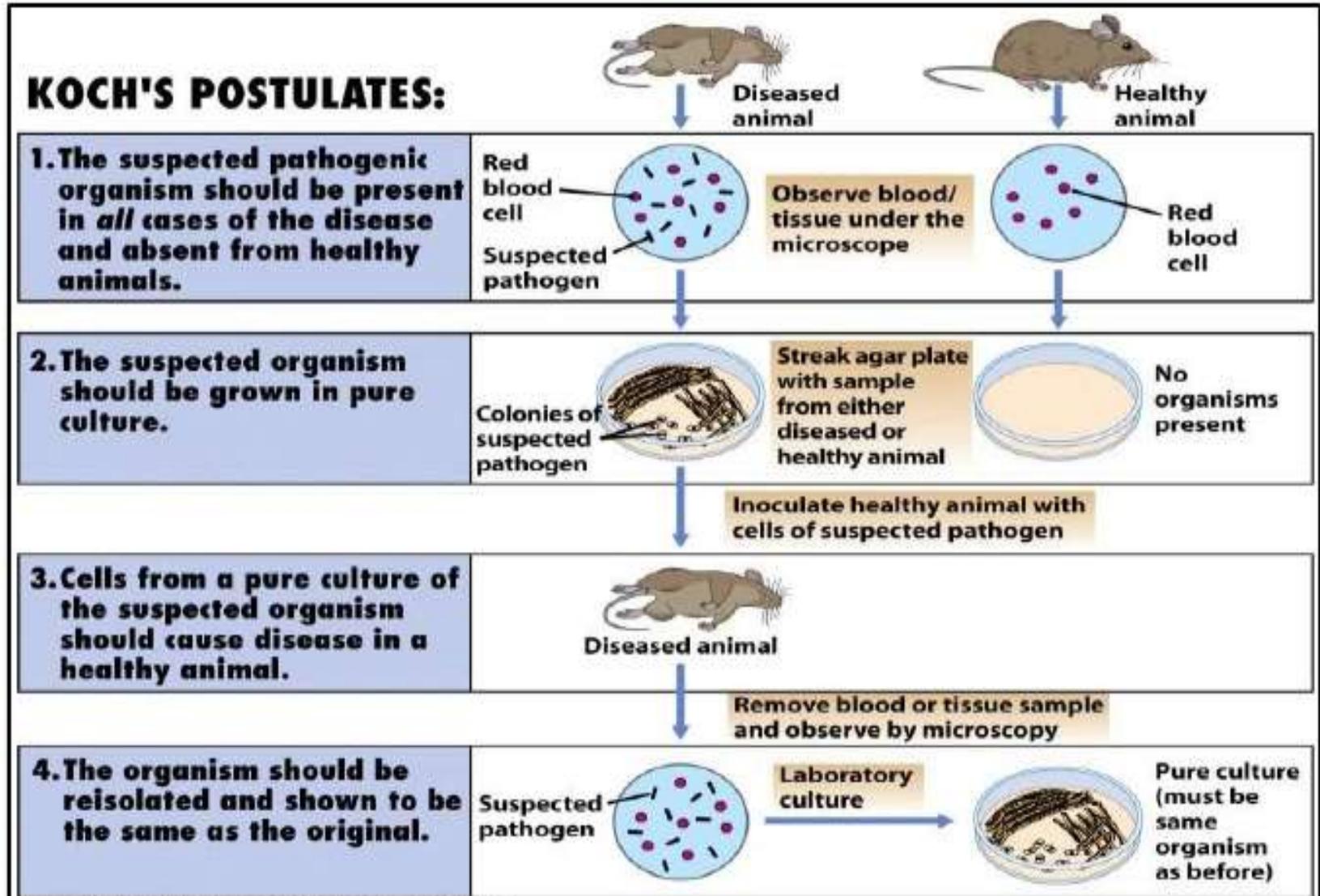


Figure 1-12 Brock Biology of Microorganisms 11/e
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Robert Koch's other contributions to science

- Staining technique for bacteria
- Hanging drop method to detect motility
- Method for isolating pure culture of bacteria by planting on solid medium
- Koch's postulates



Discovery of microbes

- Hansen 1874 – Leprosy bacillus
- Neisser 1879 – Gonococcus
- Eberth 1880 – Typhoid bacillus
- Ogston 1881 – Staphylococcus
- Loeffler 1884 – Diphtheria bacillus
- Nicolaier 1884 – Tetanus bacillus in soil
- Fraenkel 1886 – Pneumococcus
- Weichselbaum 1887 - meningococcus



Edward Jenner – Father of vaccination



Also known as the 'Father of immunology' Edward Jenner was an English scientist and is famous for his discovery of smallpox vaccine.

This was the first successful vaccine ever to be developed.

Jenner observed that pus from blisters in milkmaids who developed the less deadly cowpox was somehow protecting these women from the more virulent smallpox.

In 1796, Jenner tested his theory by injecting pus from cowpox into an eight year old boy. The boy was inoculated again and later tested, but showed no signs of disease.

This led him to his discovery of smallpox vaccine.

Other milestones in immunization



- **1897- Killed vaccine against plague**
- **1897- Killed vaccine against typhoid fever**
- **1924- BCG vaccine (Albert Calmette & Camille Guerin)**
- **1938- Vaccine against yellow fever**
- **1953- Killed polio vaccine(Jonas Salk)**
- **1963- Vaccine against Hepatitis B**
- **1979- smallpox officially declared eradicated**

Defense against microorganisms



- 1891 – Paul Ehrlich proposed that antibodies are responsible for immunity
- 1910 – cure for syphilis was discovered
- 1928 – penicillin was discovered by Alexander Fleming
- 1935 – Gerhard J. Domagk used prontosil a chemically synthesized antimetabolite, to kill streptococcus in mice
- 1940 – Selman Waksman and H.Boyd Woodruff discovered Actinomycin, the first antibiotic to be obtained pure from soli.
- 1944 – W.H.Feldman and H.C.Hinshaw successfully treat tuberculosis with streptomycin
- 1953 – first useful fungal antibiotic Nyastatin developed

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THANK
YOU