Department of biology

2025-2026

((MICROBIOLOGY))

Stage (2)

LEC- ((1))

History of microbiology

By

Asst. Lecturer ALI ALAWADI

Antonie Van Leeuwenhoek [1632-1723]:

- 1st to observe and describe single celled organisms, "*animalcules*", we now refer to as microorganisms.
- Described different morphological forms of bacteria.
- 1st to record observations of muscle fibers, bacteria, spermatozoa and blood flow in capillaries (small blood vessels).

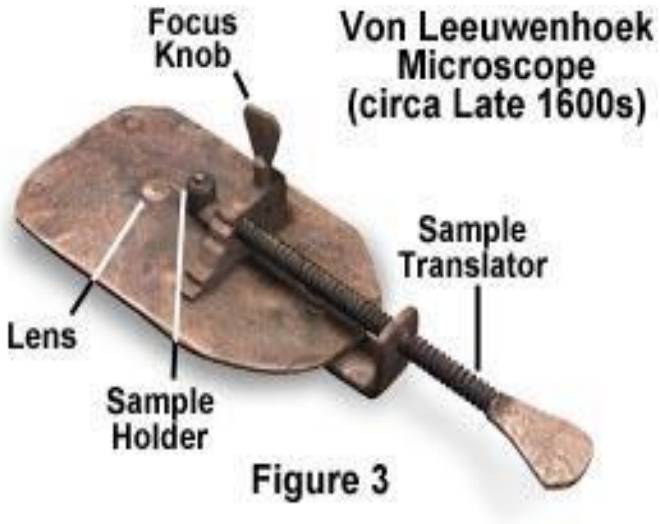
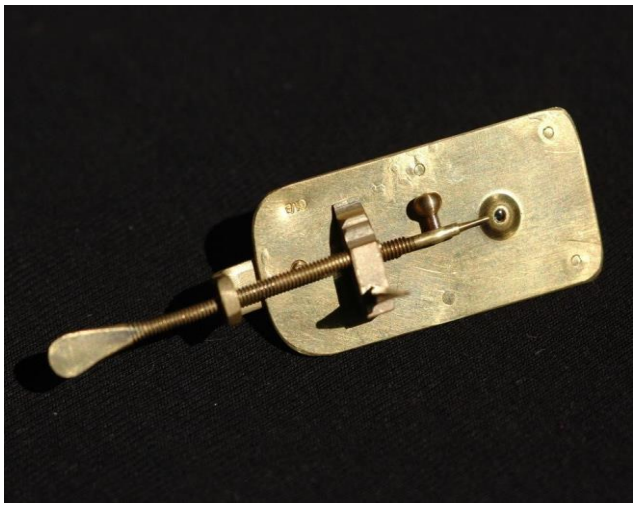
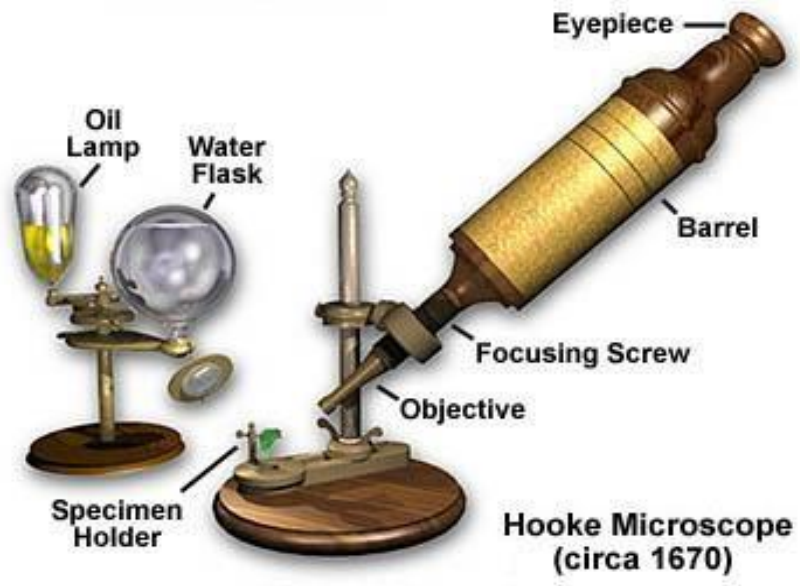


Figure 3

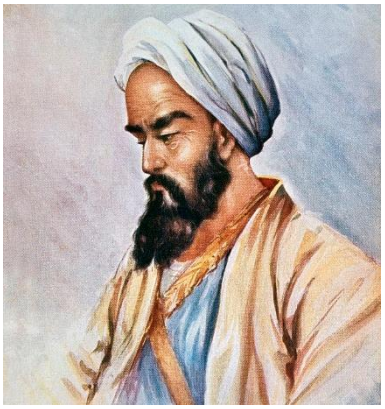


Robert Hooke [1678]:

- Developed Compound microscope
- 1st to coin the term 'Cell'



Al-Razi (865–925 AD):



- Known as Galen of the Arabs.
- Author of "*Smallpox and Measles*": first accurate description of both diseases.
- Distinguished between infectious and non-infectious diseases.
- Highlighted the concept of contagion and disease transmission.
- Applied clinical observation and experimentation in medicine.

Ibn Sina (Avicenna, 980–1037 AD):

- Author of the medical encyclopedia "*The Canon of Medicine*" (global reference for centuries).
- Suggested the existence of invisible microorganisms causing diseases.
- Explained transmission of infections through water, air, and contact.
- Provided one of the earliest theoretical foundations of the germ theory.

Ibn Zuhr (Avenzoar, 1091–1161 AD):

- Renowned Andalusian physician, known in Europe as Avenzoar.
- Accurately described parasitic infections and gastric ulcers.
- Conducted animal experiments to study diseases and their transmission.
- Considered one of the pioneers of experimental medicine in microbiology.

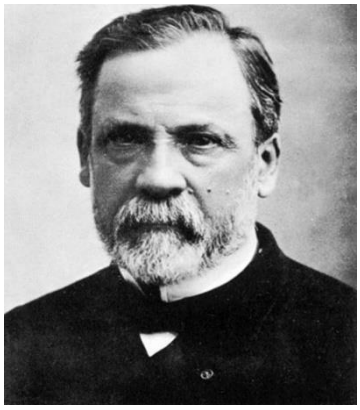
History of microbiology

Edwerd Jenner:

- Observed that the milk maids who had milder form of cowpox were not prone to Smallpox.
- After observing cases of cowpox and smallpox for few years, In 1796 he removed the fluid of a cowpox from milkmaid and inoculated James Phipps, an eight-year-old boy, who soon came down with cowpox.
- Six weeks later, he inoculated the boy with smallpox. The boy remained healthy.
- Jenner had proved his theory that the pus in the blisters which milkmaids received from cowpox protected milkmaids from smallpox.

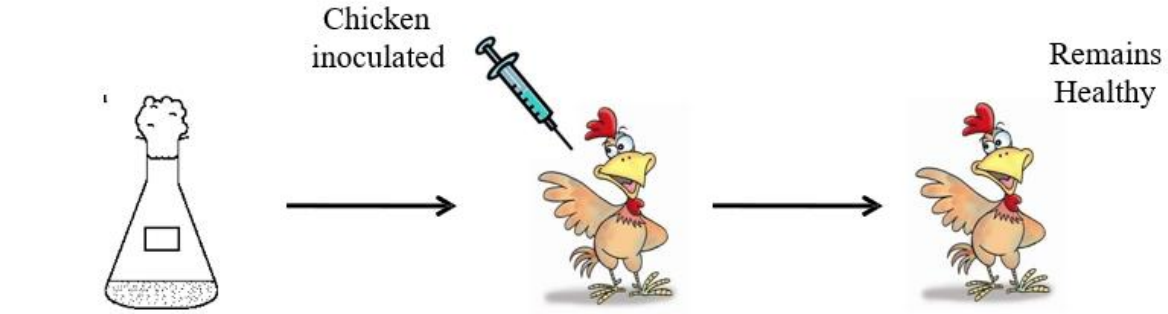
Louis Pasteur [1822-1895]:

Father of Microbiology



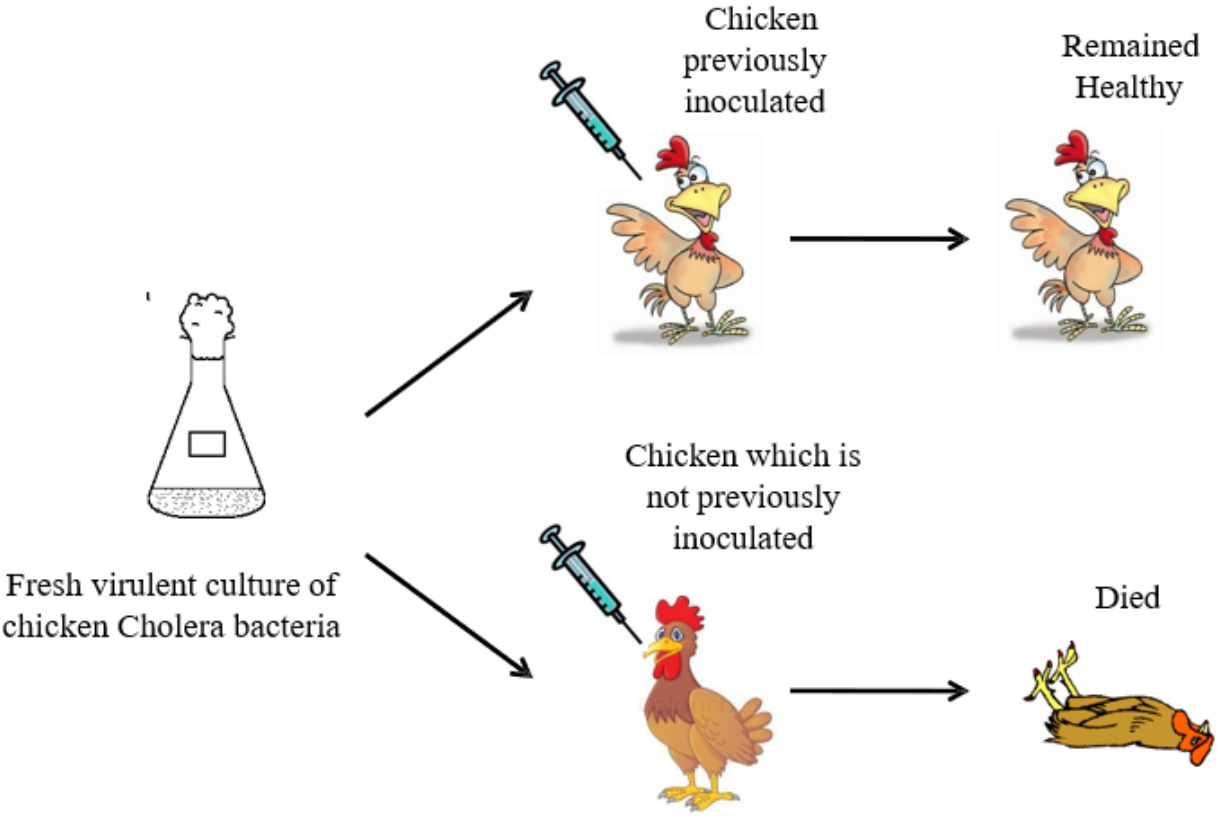
- Trained chemist from France
- Established that Fermentation was caused by microbial agents
- Demonstrated anaerobic fermentation by both bacteria and yeasts (bacteria produce acid and yeast produce alcohol)
- Developed pasteurization to prevent spoilage of wine by bacteria
- Noted that different types of fermentations were associated with different kinds of microbes
- Development of methods and techniques of Bacteriology
- proved that microbes arise only from their like
- Introduction of sterilization techniques: development of steam sterilizer, autoclave and hot-air oven
- Studies on Anthrax, Cholera and hydrophobia
- Introduced live attenuated (weakened) vaccines

[Accidental observation: chicken cholera bacillus cultures left for several weeks lost their pathogenicity but retained their ability to protect the chickens from infection]



Pure culture of chicken
Cholera bacteria
8 weeks old

After several weeks…

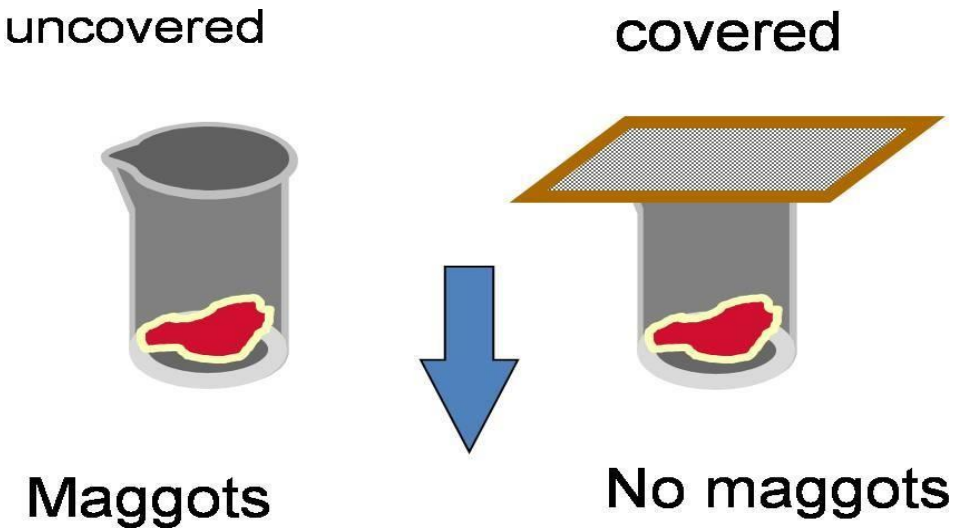


Fresh virulent culture of
chicken Cholera bacteria

- Then he attenuated anthrax bacillus by incubation at high temperatures (42°C-43°C) and proved that inoculation of such bacilli in animals introduced protection against anthrax
- He coined the term 'Vaccine' for such prophylactic preparations.
- While working on rabies, he could not isolate any microorganism from dog and man but suggested that causative agent of rabies was too small to be seen by microscope.

Spontaneous generation versus Biogenesis

- Aristotle (384-322 BC) proposed that animals might originate spontaneously from soil, plants or other unlike animals.
- His influence was strongly felt even in the 17th century.
- In 1668, Francesco Redi disproved such generation of organisms from non-living things.



John Needham (1745):

heated Nutrient Fluids and poured them into flasks and covered with corks → fluid turned turbid showing presence of microorganisms.

Spallanzani (1765):

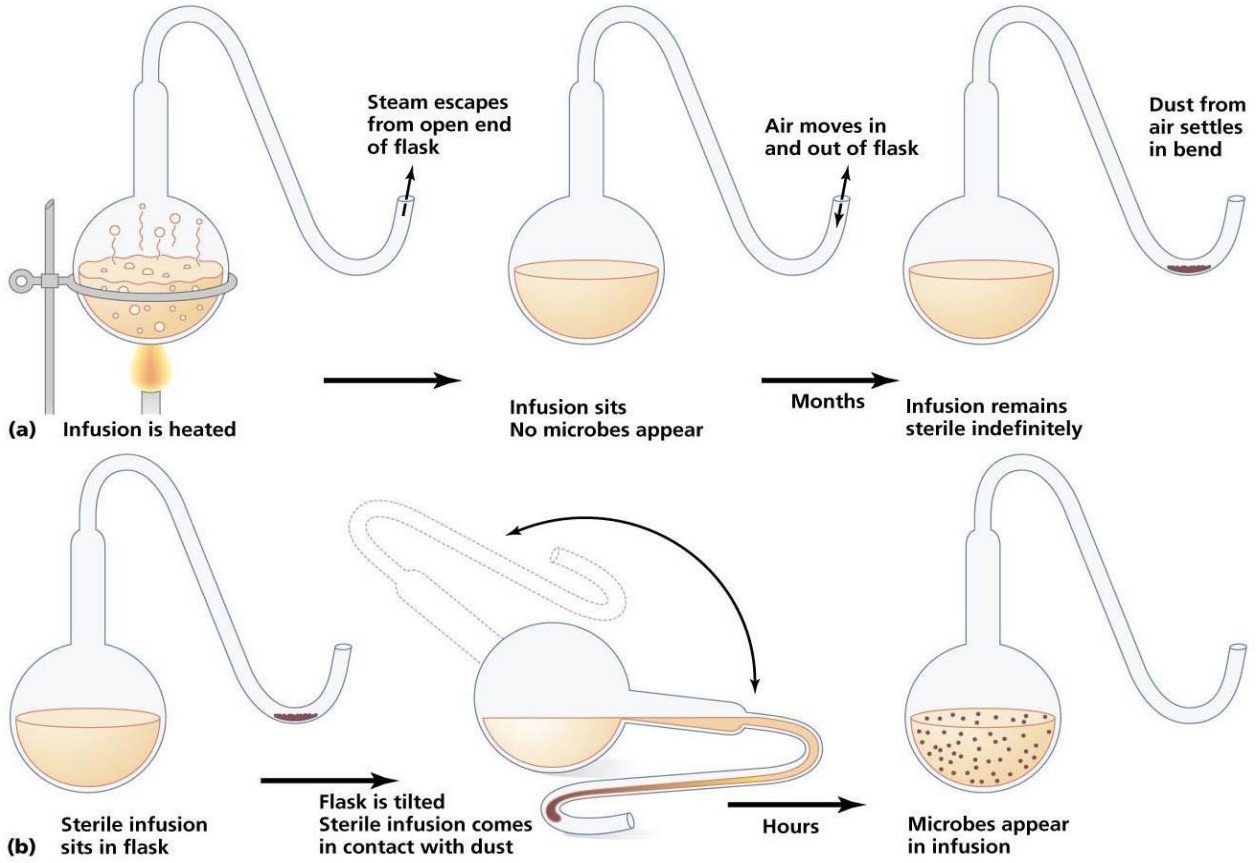
Similar to Needham's Experiments

Boiled the beef broth for hour and then immediately sealed flasks → No growth was observed in the broth.

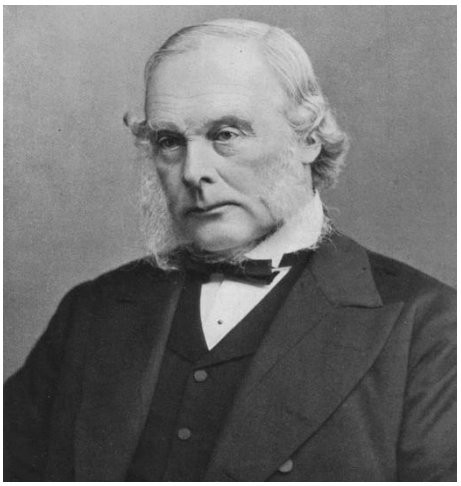
Louis Pasteur (1861)

finally disproved spontaneous generation after many years of debate.

Boiled broth in swan-necked flasks.



Joseph Lister [1827-1912]:

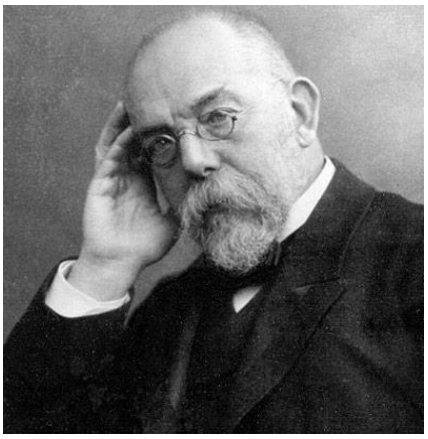


Father of Antiseptic surgery

- Professor of surgery.
- Applied Pasteur's work and introduced Antiseptic techniques in Surgery.
- Use of Carbolic acid in Antiseptic surgery
- Resulted in drop in morbidity and mortality due to surgical sepsis.

Robert Koch [1843-1910]:

Father of Bacteriology

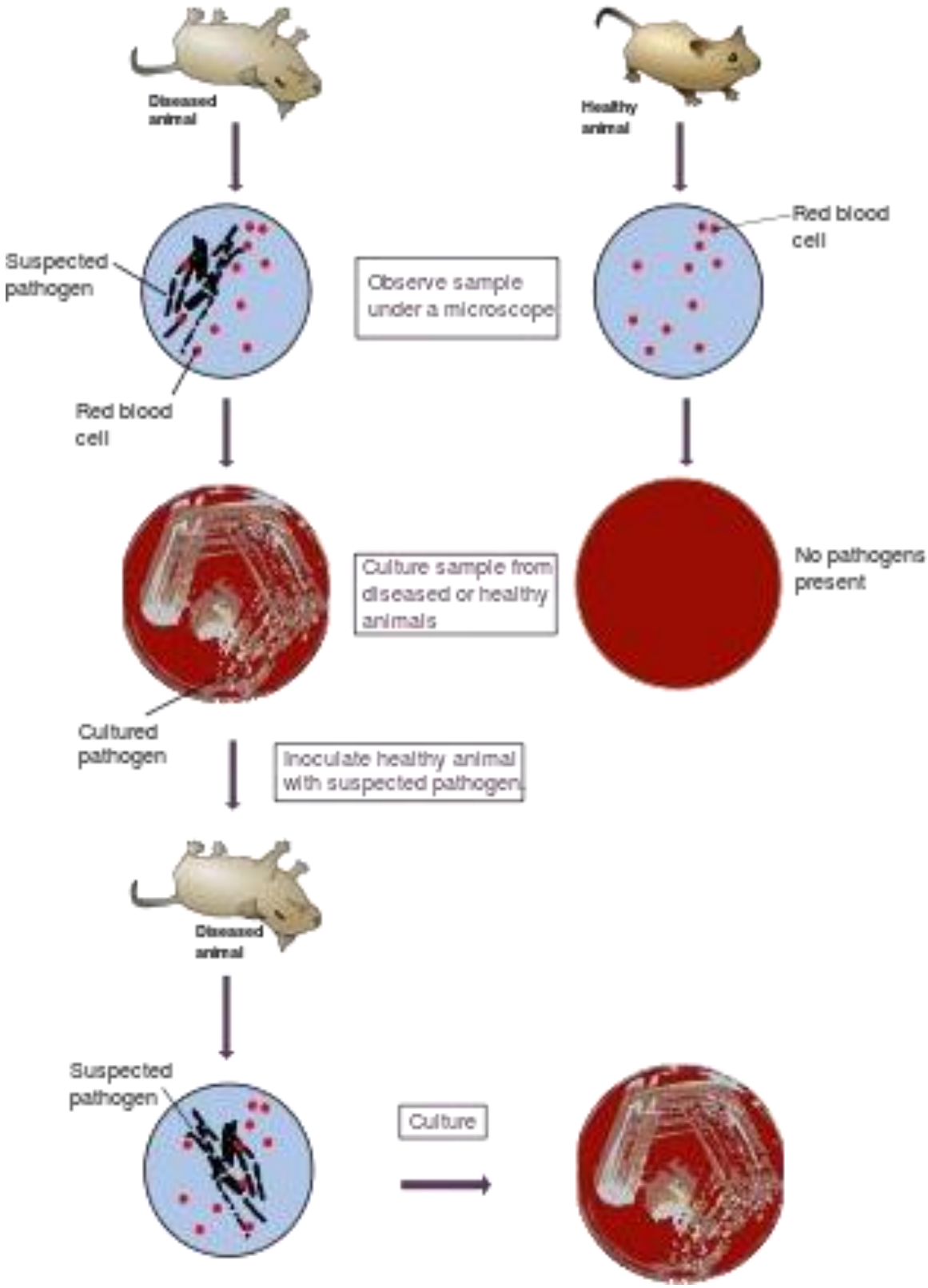


- Introduced methods for isolation of pure culture.
- Use of solid media for isolation of bacteria.
- Staining techniques.
- Discovered Anthrax bacillus (1876) Tubercle bacillus (1882), and cholera vibrios (1883).

Koch's postulates

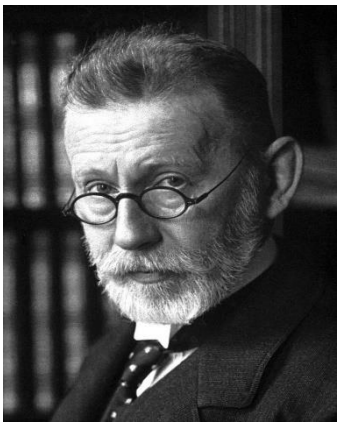
Microorganism can be accepted as the causative agent of an infectious disease only if following conditions are fulfilled:

- Disease agent must be present in every organism suffering from the disease but should be absent in healthy organism.
- It should be possible to isolate the microorganism in its pure culture from lesion of the disease.
- The isolated microorganism when introduced into suitable laboratory animal should produce the similar disease.
- It should be possible to re-isolate the microorganism in its pure culture from lesions produced in experimental animals.


Diseased animal
Healthy animal
Suspected pathogen
Observe sample under a microscope
Red blood cell
Red blood cell
Culture sample from diseased or healthy animals
No pathogens present
Cultured pathogen
Inoculate healthy animal with suspected pathogen
Diseased animal
Suspected pathogen
Culture

Paul Ehrlich [1854-1915]:

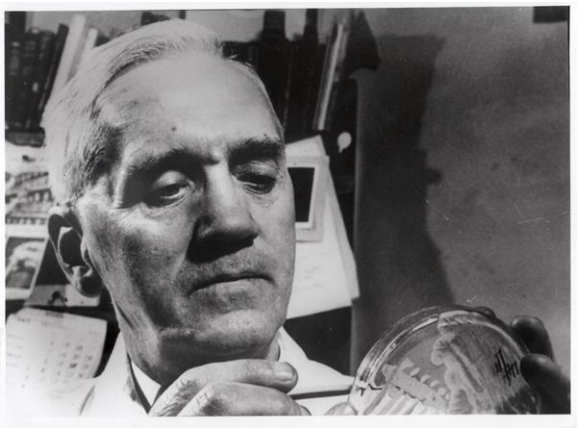
Father of Chemotherapy

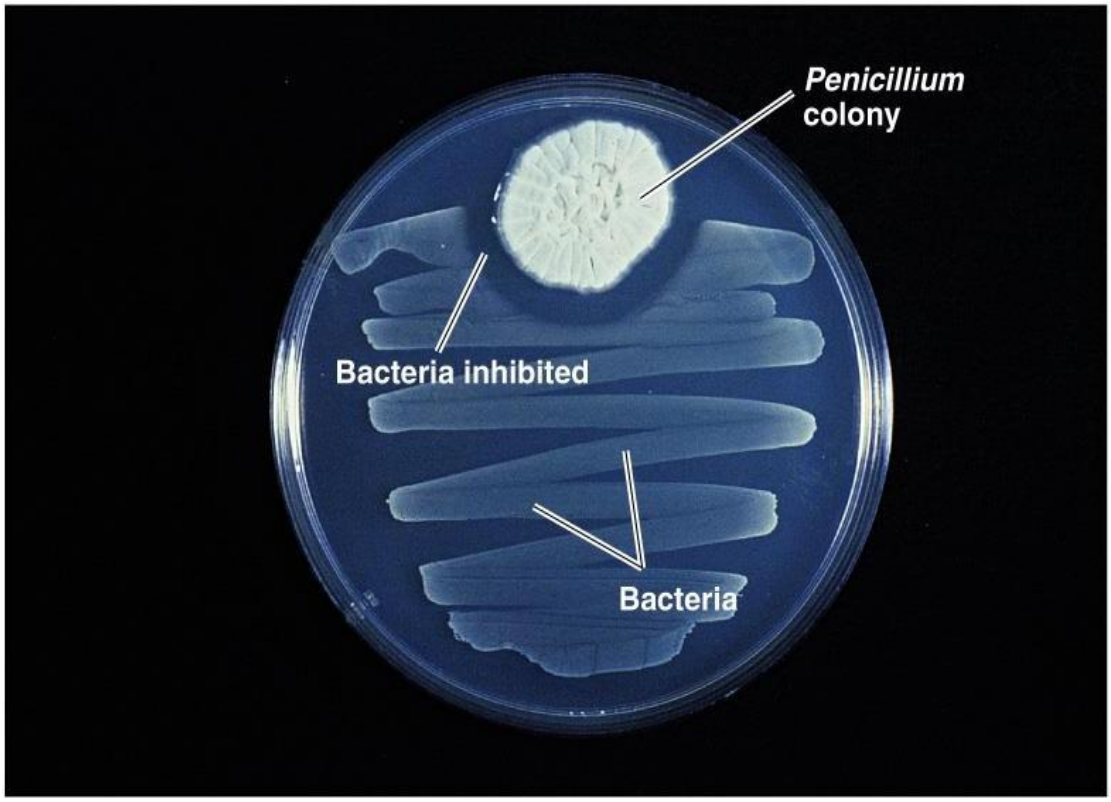


- Applied stains to cells and tissues for study of their functions.
- Reported the acid-fast nature of tubercle bacillus.
- Discovered Salvarsan (derivative of arsenic) sometimes called as ‘Magic Bullete’.
- Salvarsan: capable of destroying spirochetes of syphilis.
- Gave rise to new branch of medicine: ‘Chemotherapy’.
- In 1892, Ivanovsky removed the bacteria from diseased tobacco plant extract using some filters.
- This extract was responsible for producing tobacco mosaic disease in healthy plant.
- Beijerinck (1898) confirmed these findings and coined the term ‘Virus’ for such filterable infectious agents.
- Loeffler & Frosch (1898): Foot and mouth disease of cattle caused by similar filter-passing viruses.
- Landsteiner & Popper (1909): Virus responsible for Poliomyelitis.
- Ruska (1934): introduced Electron microscope

Alexander Fleming [1928]:

- Discovery of 1st Antibiotic.
- Accidentally discovered Penicillin produced by a fungus Penicillium.
- Left his Staphylococcus culture on an agar plate for 2 weeks → went on vacation → came back & found mold on his plate which prevented bacterial growth.





Elie Metchnikoff:

- Described how Leukocytes ingest disease producing bacteria in the body.
- Called such cells ‘Phagocytes’ & the process ‘Phagocytosis’.
- Suggested that Phagocytes are the body’s 1st & most important line of defense against infection.