INTRODUCTION AND HISTORICAL DEVELOPMENT OF MICROBIOLOGY

ASSIST. PROF. DR. ABDULAMEER ABDULLAH
UNIVERSITY OF BASRA, COLLEGE OF NURSING
2017-2018

MICROBIOLOGY

Micro : too small to be seen with the naked eye

Bio : life

Logy : study of

Microbiology : The study of organisms too small to be seen without magnification

- Bacteria (Bacteriology)
- Viruses (Virology)
- Fungi (Mycology)
- Protozoa (protozology)
- Helminthes (worms) Helminthology
- Algae (Phycology)

BRANCHES OF STUDY WITHIN MICROBIOLOGY

Immunology

Public health microbiology & epidemiology

Food, dairy and aquatic microbiology

Biotechnology

Genetic engineering & recombinant DNA technology

MICROBES ARE INVOLVED IN

nutrient production & energy flow

decomposition

production of foods, drugs & vaccines

bioremediation

causing disease

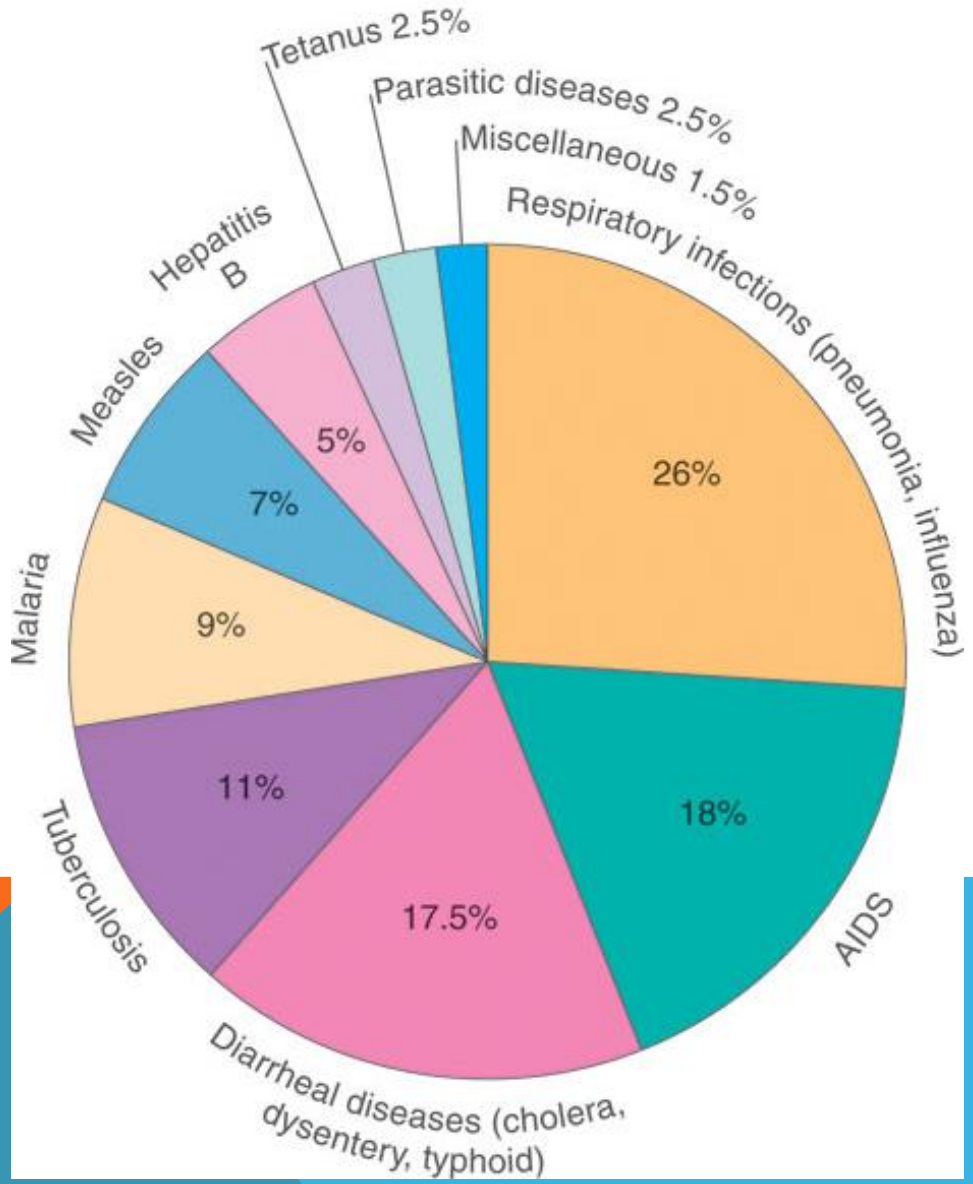
Bacteria - what comes to mind?

- Diseases
- Infections
- Epidemics
- Food Spoilage
- 95% of known bacteria are non-pathogens

IMPACT OF PATHOGENS

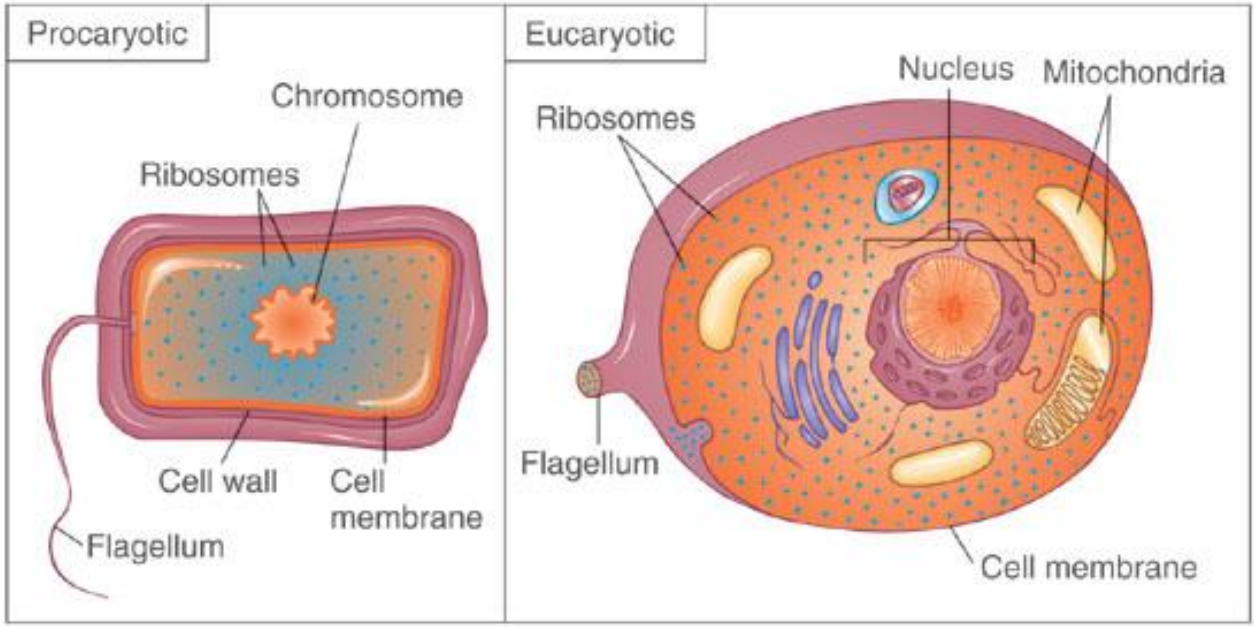
Nearly 2,000 different microbes cause diseases

10 B infections/year worldwide, 13 M deaths from infections/year worldwide


Tetanus 2.5%
Parasitic diseases 2.5%
Miscellaneous 1.5%
Respiratory infections (pneumonia, influenza)
Hepatitis B
Measles
Malaria
Tuberculosis
Diarrheal diseases (cholera, dysentery, typhoid)
AIDS
26%
18%
17.5%
11%
9%
7%
5%

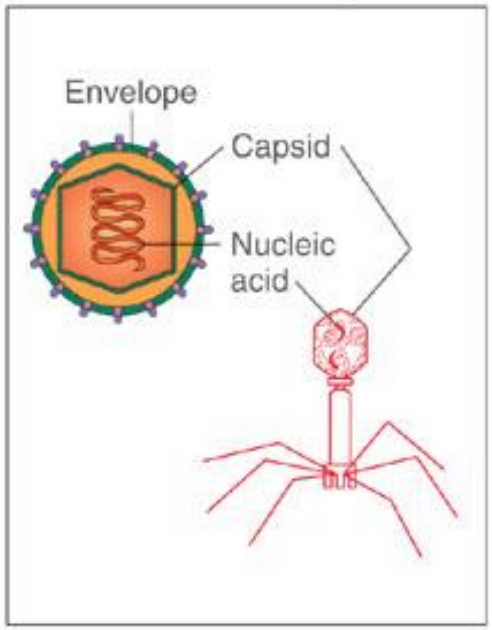
CHARACTERISTICS OF MICROBES

(a) Cell Types



Microbial cells are of the small, relatively simple procaryotic variety (left) or the larger, more complex eucaryotic type (right).

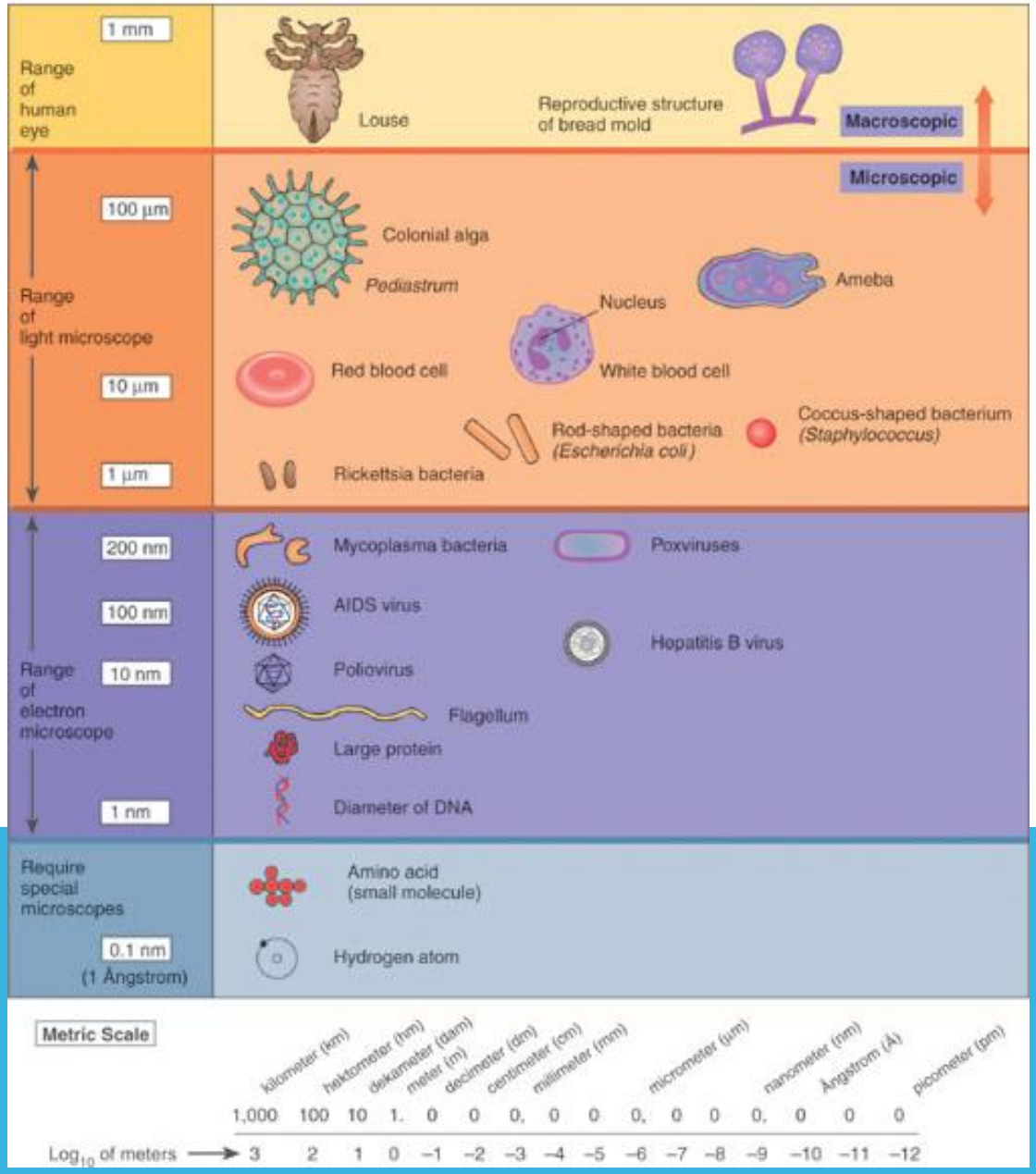
(b) Virus Types



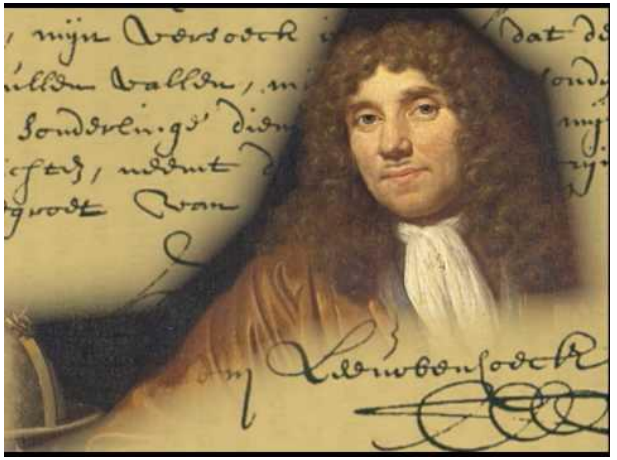
Viruses are tiny particles, not cells, that consist of genetic material surrounded by a protective covering. Shown here are a human virus (top) and bacterial virus (bottom).

Size of Bacteria

Most bacteria range in size between 0.2 micrometers (microns) to 2.0 microns



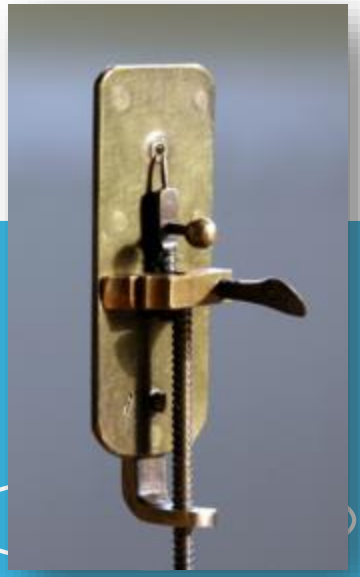
ANTONIE VAN LEEUWENHOEK

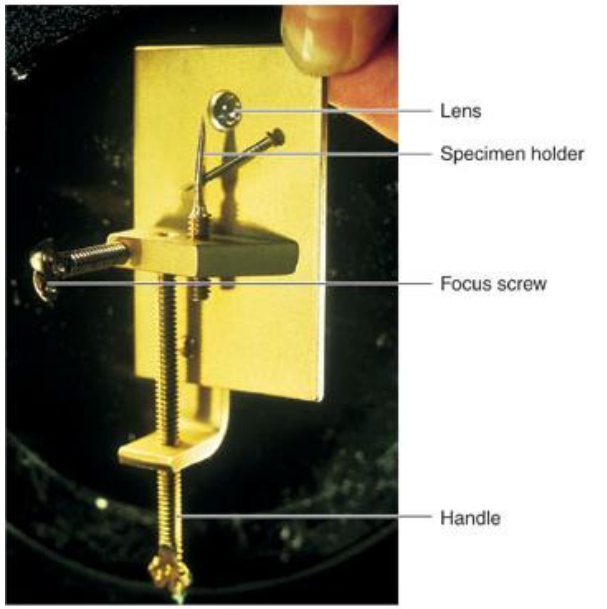


1632-1723

First to observe living microbes

his single-lens magnified up to 300X





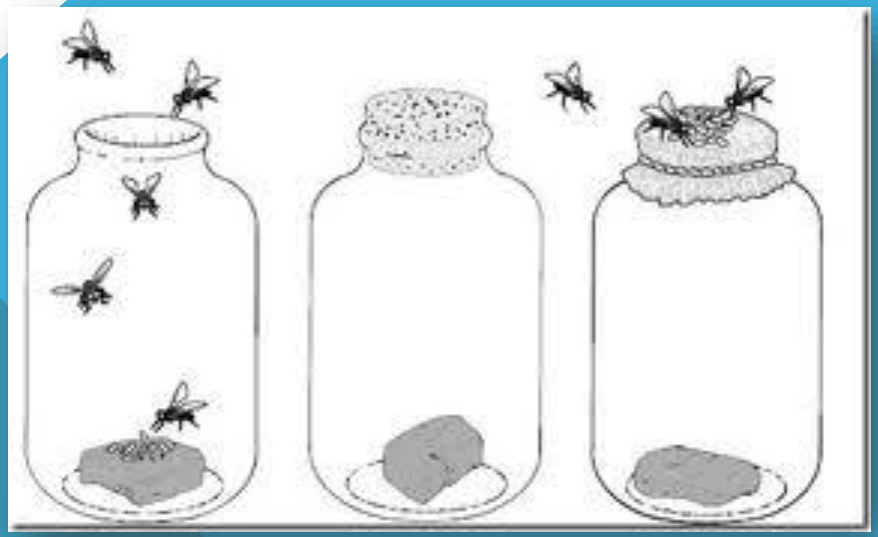
(a)

(b)

SPONTANEOUS GENERATION

EARLY BELIEF THAT SOME FORMS OF LIFE COULD ARISE FROM VITAL FORCES PRESENT IN NONLIVING OR DECOMPOSING MATTER.

(FLIES FROM MANURE, ETC)



LOUIS PASTEUR

1822-1895

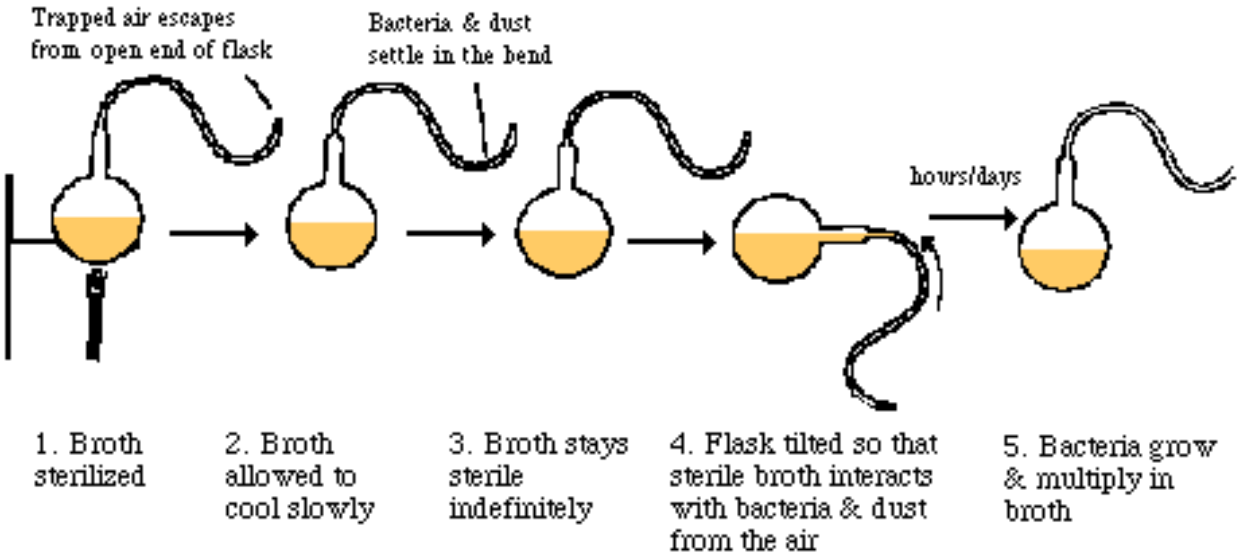
Showed microbes caused fermentation & spoilage

Disproved spontaneous generation

Developed aseptic techniques.

Developed a rabies vaccine.

PASTEUR DESIGNED SPECIAL “SWAN-NECKED FLASKS” WITH A BOILED MEAT INFUSION

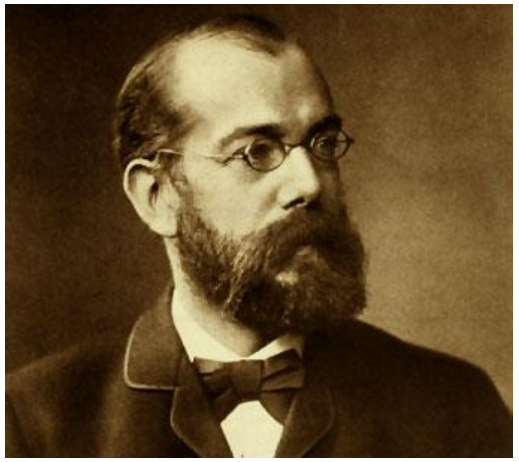


Shape of flask allowed air in (vital force) but trapped dust particles which may contain microbes

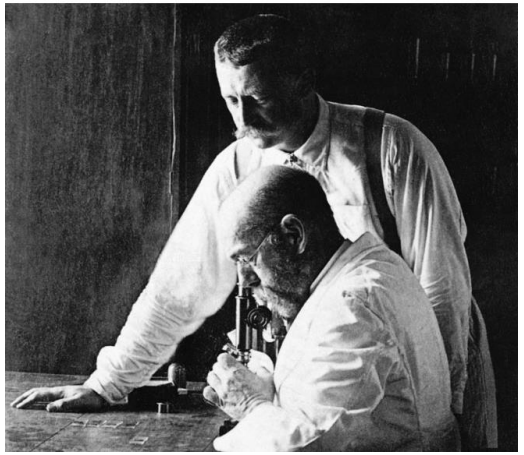
GERM THEORY OF DISEASE

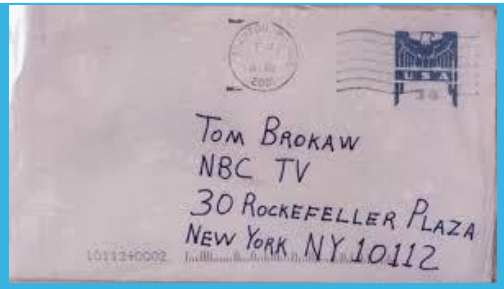
Many diseases are caused by the growth of microbes in the body and not by witchcraft bad luck ,curses ,evil spirits, or poverty, etc.

ROBERT KOCH - 1ST TO PROVE THAT BACTERIA ACTUALLY CAUSED DISEASES



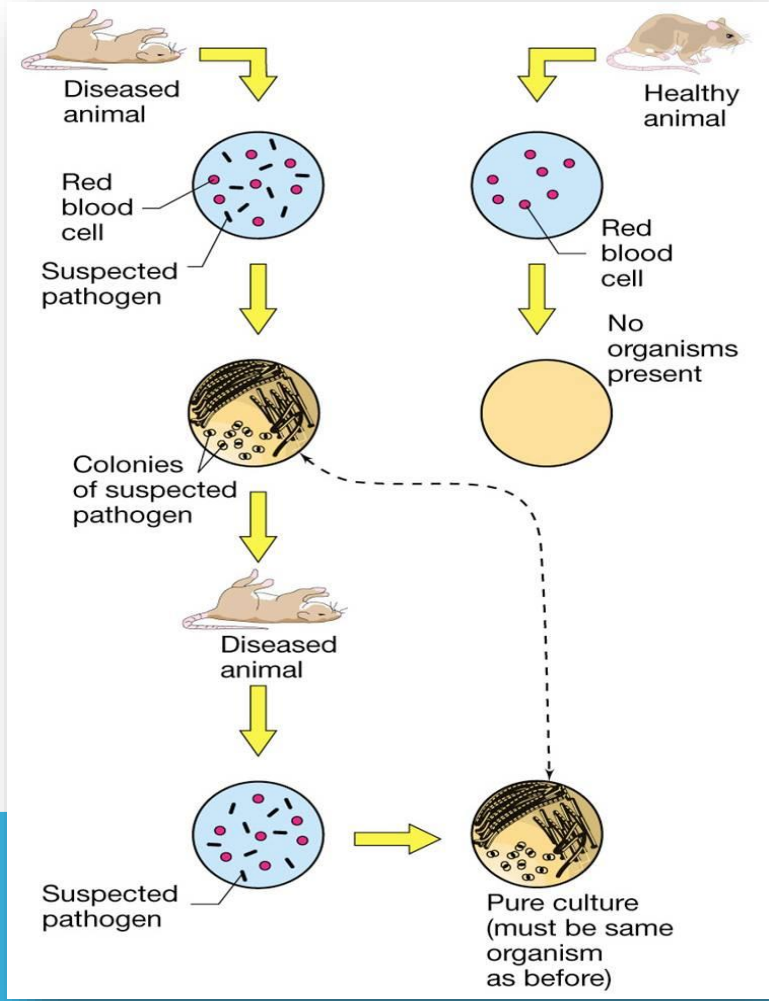
- (1843-1910)
- Established a sequence of experimental steps to show that a specific m.o. causes a particular disease.
- Developed pure culture methods.
- Identified cause of cholera, TB, & anthrax.
- 1. Cholera (fecal-oral disease)
  - *Vibrio cholerae*
- 2. Tuberculosis (pulmonary infection)
  - *Mycobacterium tuberculosis*
- 3. Anthrax (sheep and cattle)
  - *Bacillus anthracis*





ROBERT KOCH

- Established “scientific rules” to show a cause and effect relationship between a microbe and a disease
  - Koch’s Postulates
- 1. The same organisms must be found in all cases of a given disease.
- 2. The organism must be isolated and grown in pure culture.
- 3. The isolated organism must reproduce the same disease when inoculated into a healthy susceptible animal.
- 4. The original organism must again be isolated from the experimentally infected animal.



Exceptions to Koch’s Postulates

- 1. Some organisms have never been grown in pure culture on artificial media

GOLDEN AGE OF MICROBIOLOGY 1857 – 1914Q

Pasteur

- Pasteurization
- Fermentation

Joseph Lister

- Phenol to treat surgical wounds

– 1st attempt to control infections caused by microorganisms

Robert Koch

- Koch's Postulates

Edward Jenner

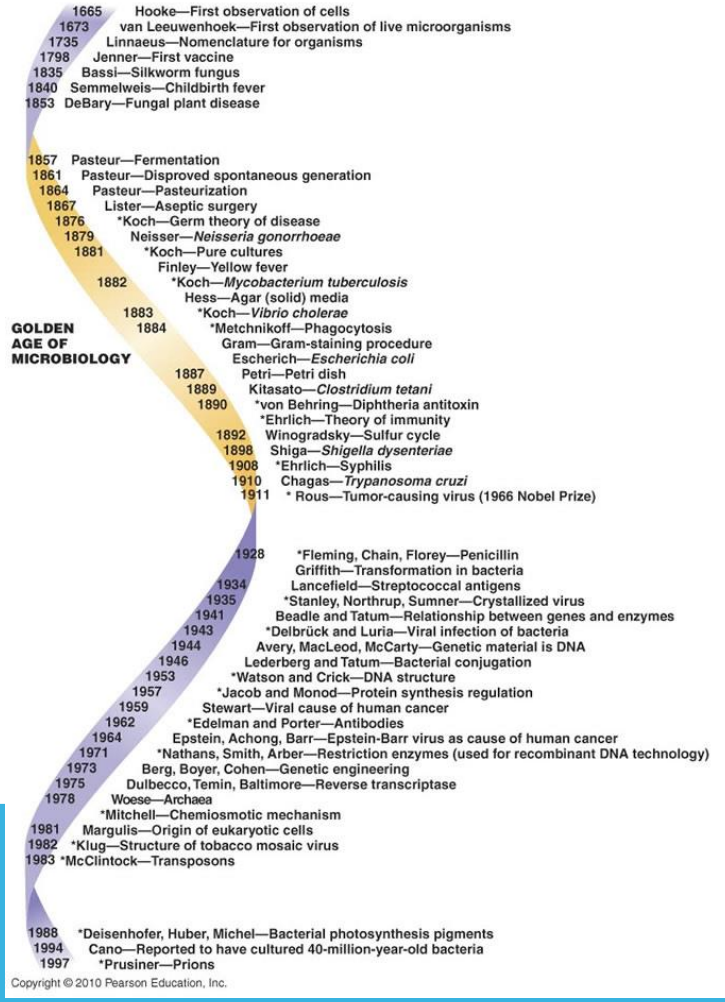
- vaccination

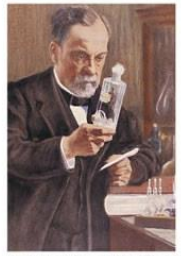
Paul Erlich

- 1st synthetic drug used to treat infections

Salvarsan - arsenic based chemical to treat Syphilis

"salvation" from Syphilis





Louis Pasteur (1822–1895)
Demonstrated that life did not arise spontaneously from nonliving matter.

Robert Koch (1843–1910)
Established experimental steps for directly linking a specific microbe to a specific disease.

Rebecca C. Lancefield (1895–1981)
Classified streptococci according to serotypes (variants within a species)

Microbes Benefit Humans

1.Bacteria are primary decomposers .

2. Microbes produce various food products: cheese, yogurt, bread

3. Microbes are used to produce Antibiotics

Penicillin : Mold : *Penicillium notatum:* Alexander Fleming(1928)

4. Bacteria synthesize chemicals that our body needs, but cannot synthesize

Example: *E. coli:* B vitamins - for metabolism: Vitamin K - blood clotting

5. Biochemistry and Metabolism

6. Microbial Antagonism

7. Insect Pest Control

8. Bioremediation

9. Recombinant DNA Technology

Gene Therapy

Genetic Engineering

10. Microbes form the basis of the food chain

THE CLASSIFICATION OF MICROORGANISMS

TAXONOMY – SYSTEM FOR ORGANIZING, CLASSIFYING & NAMING LIVING THINGS

- Domain : Three: Archaea, Bacteria & Eukarya

Eubacteria : true bacteria, peptidoglycan

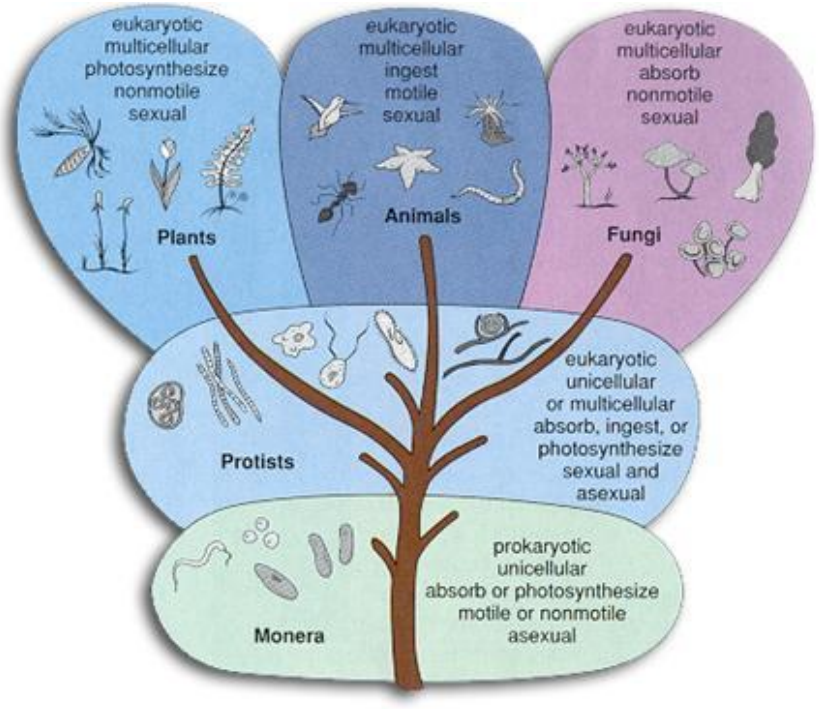
Archaea : odd bacteria that live in extreme environments, high salt, heat, etc

Eukarya: have a nucleus, & organelles

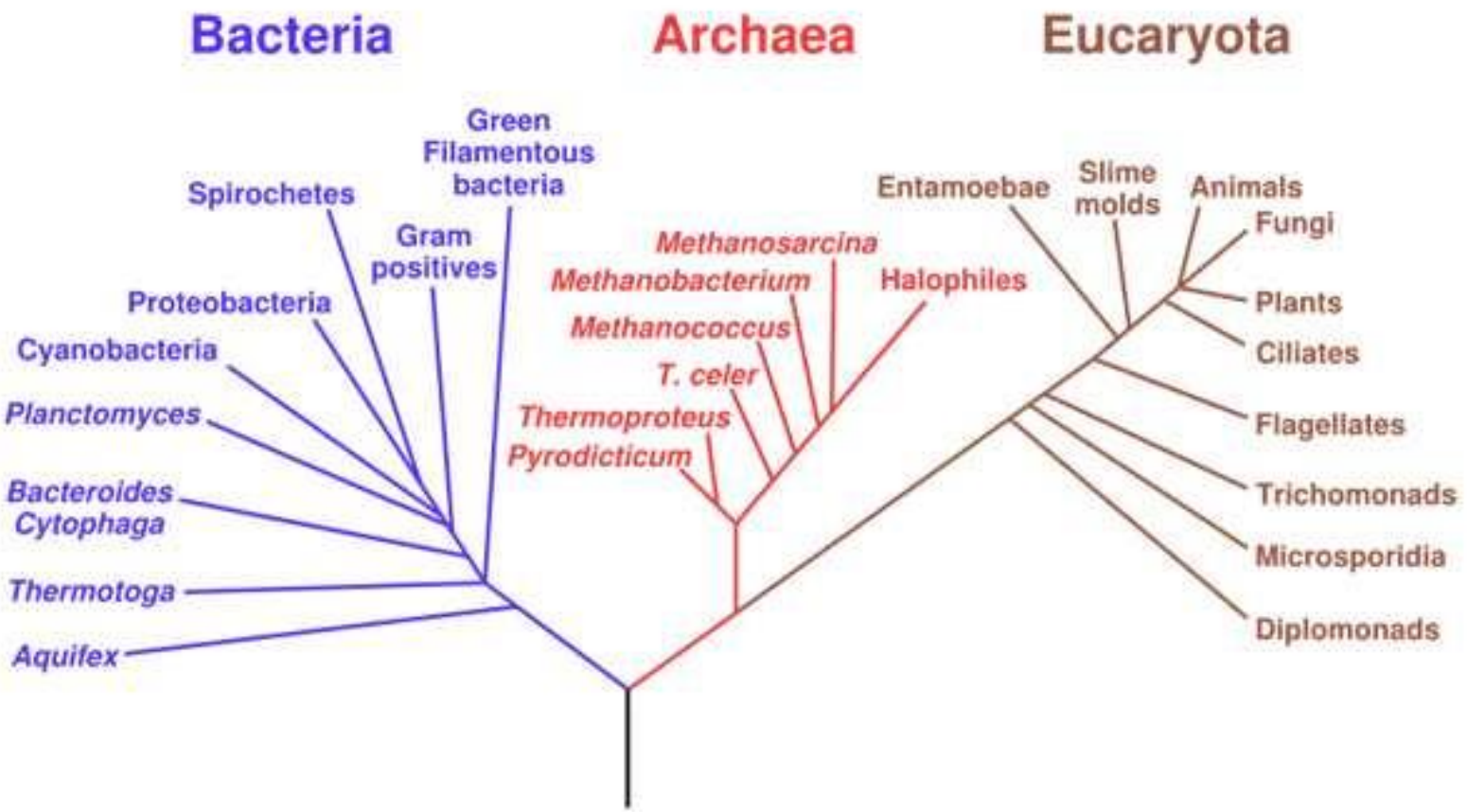
Kingdom : Five:

1. Animalia
2. Plantae
3. Fungi
4. Protista (algae - protozoa)
5. Monera - Bacteria and Cyanobacteria

- Phylum or Division
- Class
- Order
- Family
- Genus
- species



Phylogenetic Tree of Life



NAMING MICROORGANISMS

Binomial (scientific) nomenclature

Gives each microbe 2 names

- Genus - noun, always capitalized
- Species - adjective, lowercase

Both italicized or underlined

- *Staphylococcus aureus* *(S. aureus)*
- *Bacillus subtilis* *(B. subtilis)*
- *Escherichia coli* *(E. coli)*