



Introduction

Microbiology And Parasitology



CHAPTER 1

The Microbial World

Microbiology:

The study of microorganisms.

Microorganisms: Small living organisms (microbes) that generally can not be seen with the naked eye. It inhabits every corner of the globe.

Microbes are responsible for beneficial biological functions but some cause human diseases.

Include:

- Bacteria البكتيريا
- Fungi (yeasts and molds) الفطريات
- Protozoa الأوليات
- Algae الطحالب
- Multi-cellular parasites الطفيليات متعددة الخلايا

Also, include **nonliving** infectious agents:

- Virus الفيروسات
- Prion البريون: جزيئات بروتينية مدمرة يمكن أن تسبب أمراضًا عصبية.
- Viroid الفيود: هي جزيئات RNA صغيرة تسبب بعض الأمراض النباتية

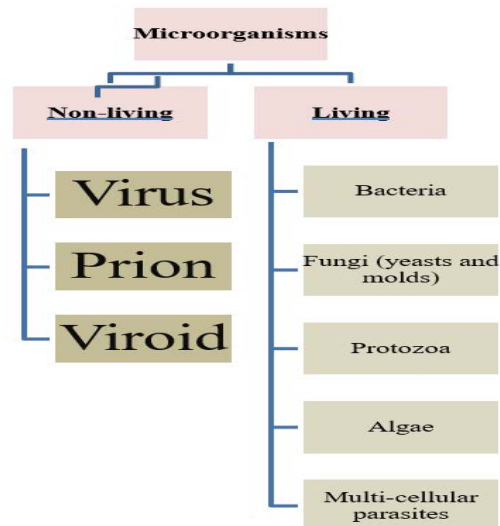
Microbes beneficial biological functions:

-**Photosynthesis:** Algae and some bacteria capture energy from sunlight and convert it to food, forming the basis of the **food chain**.

-**Decomposers:** Many microbes break down dead and decaying matter and **recycle nutrients** that can be used by other organisms.

- **Nitrogen Fixation:** Some bacteria can take nitrogen from air and incorporate it into soil.

- **Digestion:** Some in animals digestive tract (cellulose digestion in cows, rabbits, etc.) and vitamin K and B synthesis.



Medicine: Many **antibiotics** and other drugs are naturally synthesized by microbes

Food Industry: Many foods and beverages are made with microbes as Beer, Bread, Vinegar, Cheese and Yogurt

Genetic Engineering: Recent advances in gene splicing allow us to design **recombinant microbes** that produce important products as **Human growth hormone, Insulin and Hepatitis B vaccines**

Medical Research: Microbes are well suited for biological and medical research due to simple and small structures, easily manipulated genetic material grow very quickly at low cost

Microbes and Disease

- **Pathogens:** Diseases-causing microbes
- Less than 1% of all known bacteria cause human diseases
- About 4% of all known bacteria cause plant diseases
- 95% of known bacteria are non-pathogens

Time Line of Microbiology

- Anton van Leeuwenhoek (1670) = microscopy
- Edward Jenner (1796) = vaccination against smallpox
- Pasteur (1860) = Pasteurization, Fermentation
- Joseph Lister (1860)= Phenol to treat surgical wounds
- Paul Erlich (1894) articulate the principles of chemotherapy
- Alexander Fleming (1928) = Penicillin.
- 1970 Bacterial based recombinant DNA technology development.
- 1995 *Haemophilus influenzae* genome sequenced.
- 2000 *Neisseria meningitides* genome sequenced.
- The genetic map is the greatest discovery of the 20th century

Nomenclature of Microorganisms

- Binomial (scientific) nomenclature gives each organism 2 names:

الجنس • **Genus** – noun, always capitalized

النوع • **species** - adjective, lowercase

Both italicized or underlined

- *Staphylococcus aureus*, *Bacillus subtilis*
- Escherichia coli, Pseudomonas aeruginosa

Microbiology branches

علوم نقية

Different branches of microbiology are classified into **pure** and **applied sciences** as well as **taxonomy**.

علوم تطبيقية

التصنيف

- **Bacteriology**: The study of bacteria.
- **Mycology**: The study of fungi.
- **Protozoology**: The study of protozoa.
- **Phycology (or algology)**: The study of algae.
- **Parasitology**: The study of parasites.
- **Immunology**: The study of the immune system.
- **Virology**: The study of viruses.
- **Nematology**: The study of the nematodes

Apart from taxonomy, microbiology is also classified into pure sciences as:

1. **Microbial cytology** .دراسة التركيب الخلوي للكائنات الدقيقة.
2. **Microbial physiology** .دراسة وظائف الكائنات الدقيقة.
3. **Microbial ecology** .دراسة التفاعلات بين الكائنات الدقيقة.
4. **Microbial genetics** .دراسة المادة الوراثية للكائنات الدقيقة.

Applied Microbiology

- Food microbiology الميكروبيولوجيا الغذائية
- Medical Microbiology الميكروبيولوجيا الطبية
- Industrial microbiology الميكروبيولوجيا الصناعية
- Agricultural microbiology الميكروبيولوجيا الزراعية
- Soil microbiology الميكروبيولوجيا التربة
- Pharmaceutical microbiology الميكروبيولوجيا الصيدلانية
- Veterinary microbiology الميكروبيولوجيا البيطرية
- Microbial biotechnology الميكروبيولوجيا الحيوية
- Marine microbiology الميكروبيولوجيا البحرية

How do we have gained our present knowledge of microbiology?

- By using **microscopy** to study the shape and arrangement of microbes.
- **Inoculation on** or in Culture media for macro - biological study (colonial morphology).

