

A **microorganism** is an organism or life form too small to be seen without a microscope, commonly referred to as a microbe. These include bacteria, viruses , fungi, protozoa, archaea.

Microbiology is a field of science that focuses on organisms too small to be seen by the naked eye, such as bacteria, viruses, archaea, fungi, and protozoa. Through the study of these microorganisms, we learn how they affect our lives, including their roles in health, food production, the environment, and various industries. This understanding helps us harness their benefits and minimize their risks.

❖ Key Activities & Purpose:

- **Identification of Microbes:**

Detects and identifies bacteria, viruses, fungi, and parasites responsible for infections.

- **Diagnosis and Treatment:**

Diagnosing microbes involves various laboratory techniques including microscopy, culturing samples for growth, performing biochemical or genetic tests for identification, and detecting specific antigens or antibodies.

The treatment for a microbial infection depends on the type of microbe (bacterial, viral, fungal, parasitic) and the site of infection, and often includes antibiotics, antivirals, or antifungals , guided by the results of antimicrobial susceptibility testing.

Equipments Used

- **Microscopes:** For examining the morphology and characteristics of microorganisms.
- **Incubators:** Controlled environments to culture and grow microbes.
- **Autoclaves:** Used for sterilizing glassware, media, and other materials.
- **Petri Dishes:** Used for culturing microorganisms on solid growth media.
- **Pipettes:** For precise transfer of liquids.
- **Culture Media:** Nutrient-rich substances used to grow bacteria and other microorganisms.

Culturing is the term used to describe growing microbes, usually combined with tests to see what the microbes like to eat or what conditions they can live in.

Microbiology culture methods involve growing microorganisms on or in nutrient-rich media under controlled conditions to isolate, identify, and study them for research, diagnostic, and industrial purposes.

Common Culture Methods :

- **Streak Plate Method**

This technique is used to isolate bacteria in pure cultures from a mixed sample. A small amount of the sample is streaked across the surface of an agar plate in a series of sections, thinning the inoculum with each streak to obtain well-separated colonies.

- **Pour Plate Method**

Used for quantitative analysis, this method involves mixing a diluted sample with molten agar, then pouring it into a petri dish. Colonies grow both on and within the agar, allowing for an accurate count of viable bacteria.

- **Spread Plate Method**

A small volume of a diluted liquid sample is spread evenly over the surface of an agar plate using a sterile spreader. This method is also used to isolate the viable microorganisms (like bacteria and fungi) from a diluted liquid sample .

- **Liquid (Broth) Culture**

Microorganisms are grown in a liquid medium, such as MacConkey Broth, Nutrient broth and Luria broth, in a flask. This method is useful for obtaining large quantities of microbes for downstream applications like preparing antigens or for use in various tests.

- **Lawn Culture:**

This method produces a uniform, carpet-like surface growth of bacteria. It's used for antibiotic sensitivity testing or preparing bacterial antigens.

- **Stab Culture:**

A wire is used to inoculate a semi-solid agar medium by stabbing it into the medium. Used to determine bacterial motility and require oxygen levels in stab tube. This is often used to maintain stock cultures.

The most important types of culture media based on application:

Basal media

are simple, general-purpose culture media containing essential nutrients like carbon and nitrogen sources, amino acids, vitamins. They are allowing of growth for most organisms. Example include Nutrient agar.

Selective media

It is a growth medium designed to allow the growth of specific M.O while inhibiting the growth of unwanted ones. The inhibition occurs by adding bile salts, antibiotics, dyes, PH adjustments. Example include Salmonella-Shigella Agar

Differential media

This media shows visible changes due to the presence of an indicator like neutral red, phenol red, or methylene blue. It differentiates bacteria based on colony color growing on the same plate. Example include Mannitol Salt Agar .

How to prepare the culture media ?

Steps for preparation of culture media

- You must weigh the specific ingredients that are listed on the container.
- Dissolve them in distilled or deionized water into flask or beaker
- Sterilize the mixture using an autoclave at 121°C for 15 minutes to eliminate contaminants.
- Finally, the culture medium is cooled and poured into sterile Petri dishes or tubes using aseptic techniques.

Key Principles

- **Inoculation:**

Introducing a microbial sample into a growth medium using aseptic techniques to prevent contamination.

- **Incubation:**

Providing a suitable environment (correct temperature, pH, and gas levels) for the microbes to grow and reproduce.

- **Isolation:**

Separating a single microorganism from a mixed culture to obtain a pure culture, also known as an axenic culture.

- **Inspection:**

Observing the characteristics of the microbial growth, which helps in identification.