

Micro Organisms

Microorganisms

Major Groups of Microorganisms

- ◆ Bacteria – Eg. *Lactobacillus* and *Rhizobium*
- ◆ Fungi – Eg. *Penicillium* and *Aspergillus*
- ◆ Protozoa – Eg. *Amoeba* and *Paramecium*

Where do Micro-organisms live?

- ◆ They are found in all living beings, plants and animals. Microorganisms can live in the air, on land, and in fresh or salt water environments. However, most microbes need water to survive, therefore, wherever there is water there are microbes.
- ◆ There is not one place on earth that does not have bacteria or some other microorganism living there.
- ◆ They can survive at temperatures less than 20°C temperatures, hotter than boiling water.

Microorganisms and us

Friendly Microorganisms

There are a number of microorganisms that are useful to us.

- (i) *Lactobacillus* for the production of curd (yogurt) from milk.
- (ii) *E.coli* bacteria are used for the production of drugs such as insulin and antibiotics, after genetically modifying the bacteria.
- (iii) *Nitrosomonas* is used for sewage treatment.
- (iv) *E.coli* produces vitamin K and vitamin B₆ and B₁₂ in our digestive tract which is essential nutrients for our body.
- (v) *Streptomyces* bacteria is used in making antibiotics.
- (vi) Fungus *Penicillium* revolutionized medicine with the discovery of penicillin antibiotic obtained from it.
- (vii) Microorganisms such as bacteria and fungi act as decomposers in the ecosystem, decomposing dead plants and animals. Through the decay process, elements such as carbon, nitrogen and sulphur are released into the soil, making it more fertile.
- (viii) Many vaccines are prepared from microorganisms to protect them from like tuberculosis, polio etc.
- (ix) *Yeast* is used in dough to make porous and spongy bread and cakes.
- (x) *Yeast* is also used to convert natural sugars present in grains into alcohol.

Fermentation

- ◆ Louis Pasteur discovered the process of fermentation.
- ◆ The process of converting sugar into alcohol is called fermentation.
- ◆ *Yeast* convert the natural sugars present in grains into alcohol.

- ◆ Wine is also produced by fermentation.

Antibiotics

- Medicines used to cure a variety of diseases caused by bacteria, protozoans. However, antibiotics are not effective against diseases caused by virus.
- Penicillin is the first antibiotic discovered by Alexander Fleming in 1929 from the fungus *Penicillium*.
- Some commonly used antibiotics which are produced from bacteria and fungi are streptomycin, tetracycline and erythromycin.

Vaccination

- ◆ When diseases carrying microbes enter our body, it produces antibodies to fight against them.
- ◆ Vaccine is prepared by inactivating the disease causing microbes so that it can produce antibodies but not the symptoms of the diseases caused by these microbes.
- ◆ Several diseases like hepatitis, chicken pox, tuberculosis etc can be prevented by vaccination.
- ◆ Small pox has been completely eradicated from the world.

Harmful microorganisms

- ◆ Pathogens are disease causing microorganisms. They thrive under unhygienic conditions.
- ◆ Microorganisms cause diseases like typhoid, cholera, tuberculosis, chicken pox, swine flu etc., which can spread from an infected person through air, water food or physical contact.
- ◆ Cause plant diseases like rust of wheat and citrus cancer.
- ◆ Bacteria and fungi cause food poisoning by producing toxic substances in the food.
- ◆ Bacteria and protozoans cause pollution of water and make it unfit for drinking.
- ◆ Anthrax caused by a bacterium, is a dangerous human and cattle disease.
- ◆ Foot and mouth disease is caused by a virus in cattles.
- ◆ In birds, Bird flu is caused by virus.
- ◆ Some insects like housefly and mosquitoes act as carriers for diseases causing microbes.
- ◆ Housefly transfers pathogens from contaminated food to uncovered food. Therefore, food should always be kept covered.
- ◆ Female *Anopheles* mosquito is a carrier for malaria parasite *Plasmodium*.

- ◆ Female *Aedes* mosquito acts as a carrier for dengue virus.
- ◆ Hence, we should not allow water to collect anywhere to prevent mosquitoes from breeding.
- ◆ Common human diseases caused by viruses include the common cold, influenza.
- ◆ Serious diseases caused by viruses are chicken pox, Jaundice, AIDS, SARS, Herpes, Swine flu, mumps etc.
- ◆ Most of the viral diseases are contagious and spread from person to person.

Some Common Human Diseases caused by Microorganisms

Human Disease	Causative organism	Mode of transmission	Preventive measures (General)
Tuberculosis	Bacteria	Air	Keep the patient in complete isolation. Keep the personal belongings of the patient away from those of the others. Vaccination to be given at suitable age.
Measles	Virus	Air	
Chicken Pox	Virus	Contact	
Polio	Virus	Water	
Cholera	Bacteria	Air/Food	Maintain personal hygiene and good sanitary habits. Consume properly cooked food and boiled drinking water. Vaccination.
Typhoid	Bacteria	Water	
Hepatitis B	Virus	Water	Drink boiled drinking water. Vaccination.
Malaria	Protozoa	Mosquito	Use mosquito net and repellents. Spray insecticides and control breeding of mosquitoes by not allowing water to collect in the surroundings.

- ◆ Many pathogens attack crop plants like sugarcane, wheat, rice potato and reduce their yield.

Some Common Plant Diseases caused by Microorganisms

Plant Diseases	Causative organism	Mode of Transmission
Citrus canker	Bacteria	Air
Rust of wheat	Fungi	Air, seeds
Yellow vein mosaic of <i>bhindi</i> (Okra)	Virus	Insect

Food Preservation

Food is preserved from the attack of microorganisms by the following methods:

- ◆ **Chemical method:** Preservatives like sodium benzoate are added to pickles, jams and squashes to prevent the growth of microorganisms. Chemical methods of preservation of jams and squashes use preservatives like sodium benzoate and sodium metabisulphite.
- ◆ **Preservation by common salt:** Meat and fish are preserved by covering them with dry salt. It is also used to preserve pickles, tamarind etc. Common salt absorbs moisture from food, making it dry and uninhabitable for microbes.

Food preservatives added

- ◆ **Preservation by sugar:** Excess of sugar prevents the growth of microorganisms by reducing moisture content in the jams, jellies, squashes, amala murabba etc.
- ◆ **Preservation by oil and vinegar:** Bacteria cannot survive in the presence of oil or vinegar (due to its acidic nature). Therefore, many vegetables, fish and meat are preserved by this method.

Nitrogen Fixation

- ◆ Nitrogen is needed by the plants for their growth. They cannot absorb nitrogen directly from the air. There are microorganisms like some bacteria and blue green algae in the soil that take nitrogen from the air and make nitrogenous compounds. Thus, they enrich the soil with nitrogenous compounds and make it fertile.
- ◆ **For example: *Rhizobium*,** a nitrogen fixing bacteria, form nodules on the roots of beans and other plants in the legume family.
- ◆ The circulation of nitrogen between organisms and the atmosphere is called the nitrogen cycle.

