

Microbes in Human Welfare

- **Microorganisms** make up the largest number of living organisms on the planet. They play an important role in the welfare of human society.
- **Advantages of microbes in household and industrial products –**
- **In household products:**

Lactic acid bacteria (LAB) or *Lactobacillus* help in the conversion of milk into curd. *Saccharomyces cerevisiae* is also known as brewer's yeast. It is used for making bread. *Propionibacterium sharmanii* produces large amount of CO₂, which causes large holes in Swiss cheese.

- **In industrial products:**

Saccharomyces cerevisiae is used for commercial production of alcohol and wine.

Antibiotics: Antibiotics are medicines produced by certain microorganisms, to kill other disease-causing microorganisms. For example, *Penicillium notatum* produces the chemical penicillin, which checks the growth of *Staphylococci* bacteria.

A fungus called *Aspergillus niger* is used for the production of citric acid.

The bacterium called *Acetobacter aceti* is used for the production of acetic acid. Similarly, *Clostridium butylicum* and *Lactobacillus* are used for the production of butyric acid and lactic acid respectively.

The bacterium called *Streptococcus* is used for the production of streptokinase, which is used as clot buster for removing clots from the blood vessels of patients.

The fungus called *Trichoderma polysporum* is used for the production of Cyclosporin A. Cyclosporin A is used as an immunosuppressive agent.

The yeast called *Monascus purpureus* produces statins, which are used as blood-cholesterol-lowering agents.

Advantages of microbes in sewage treatment and biogas production-

- **In sewage treatment:**

Sewage is municipal waste matter that is carried away in sewers and drains.

Primary sewage treatment: It is a mechanical process that involves the removal of coarse solid material.

Secondary sewage treatment: It is a biological process that involves the action of microbes.

- **In the production of biogas:**

- Microbes are used as a source of energy.
- Bacteria such as *Methanobacterium* are found in anaerobic sludge during the treatment of sewage.
- Such bacteria help in the production of *gobar gas* or biogas.
- Biogas is a mixture of methane and carbon dioxide produced by bacterial degradation of organic matter and used as a fuel.

Biological oxygen demand (BOD)

- It is used for measuring the amount of organic matter present in waste water.
- The greater the BOD of a water sample, the more will be its pollution.

Advantages of microbes as bio-control agents and bio-fertilizers -

- **As bio-control agents:**

- Microbes are used as bio-pesticides to control insect pests in plants. o Examples include the bacterium called *Bacillus thuringiensis* and the fungi called *Trichoderma*.
- Baculovirus is also used as a bio-pesticide against insects and arthropods.

- **As bio-fertilizers:**

- Biofertilizer refers to living organisms that increase the soil fertility.
- *Rhizobium* is a symbiotic bacteria found in the root nodules of leguminous plants.
- *Azospirillum* and *Azotobacter* are free-living, nitrogen-fixing bacteria.
- *Anabaena*, *Nostoc*, etc., are examples of nitrogen-fixing cyanobacteria.