

NEET · CBSE eBOOKS

CLASS 11 & 12th



Learning Inquiry
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CLASS 12th

**Microbes in Human
Welfare**

misostudy



01. Introduction

Microorganisms are the major components of biological system on earth. They are present everywhere, i.e. in soil, water, air, inside our bodies and in that of other living organism. They even exist on sites where no other life form could possibly exist like highly saline or highly acidic atmosphere or under layers of snow or even deep inside the thermal vents.

02. Microbes in Household Products

Curd

It is prepared by the action of *Lactobacillus*, commonly called **Lactic Acid Bacteria (LAB)**, which grow in milk and convert it into curd. LAB produces some enzymes (e.g. lactase) that coagulate and partially digest the milk proteins improving the nutritional quality of curd by increasing vitamin-B₁₂ and organic acid content.

Yoghurt

It is produced by fermenting whole milk with a mixture of *Streptococcus thermophilus* and *Lactobacillus bulgaricus* at 40-46° C. It has flavour of lactic acid and acetaldehyde.

Cheese

It is one of the oldest food items in which microbes are used. This is formed by coagulation of the milk protein casein. The large holes in 'Swiss cheese' are due to the production of a large amount of CO₂ by a bacterium named *Propionibacterium sharmani*

Bread

Saccharomyces cerevisiae, the common yeast can be used in baking bread and other products. It converts the sugars present in dough into carbon dioxide.

Butter

The microorganisms such as *Streptococcus lactis* and *Leuconostoc citrivorum* are used to prepare butter by churning of sweet or sour cream.

Fibres

Bacteria are used in the separation of fibres of flax, hemp and jute. For this purpose, the stems of plants are submerged in water, where the bacterial activity results in the rotting of the softer parts. The tough best fibres become loosened and easily separate from each other.

03. Microbes in Sewage Treatment

A large quantity of waste water is generated every day in cities and towns. The major component of this waste water is human excreta. It contains large amounts of organic matter and pathogenic microbes also. This huge quantity of sewage or urban waste water is never discharged into natural waterbodies like rivers and streams directly. It is first treated and made less polluted by passing it through Sewage Treatment Plants (STPs). In this, treatment of wastewater is done by the heterotrophic microbes naturally present in the sewage.

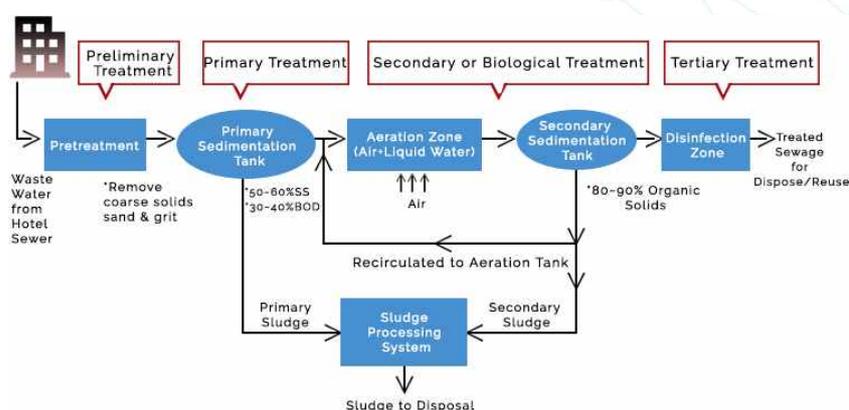
Primary treatment

It is a physical process that involves physical removal of large as well as small particles from the sewage through filtration and sedimentation in primary settling tanks.

Initially, the floating debris is removed by sequential filtration and then, soil and small pebbles are removed by sedimentation. All solids undergo sedimentation and settle down to constitute the primary sludge. The supernatant left after removing primary sludge, constitutes the effluent. This effluent is taken out for secondary treatment. The sewage sludge is treated *via* sludge digestion. This sludge can also be disposed by several ways. It can be used to produce biogas also

Secondary treatment

It involves microbial degradation of organic matter. The primary effluent is passed into large aeration tanks, where it is constantly agitated mechanically. Air containing heterotrophic microorganisms is constantly pumped into the effluent. This allows a vigorous growth of aerobic microbes into flocs, i.e. masses of bacteria associated with fungal filaments to form mesh-like structures. While growing, these microbes consume the major part of the organic matter, present in the effluent which significantly reduce the BOD (Biochemical Oxygen Demand).



The sewage water is further treated till the BOD reduces significantly. Then, the effluent of aeration tank is passed into a settling tank, where the bacterial 'flocs' are allowed to sediment. This sediment is called **activated sludge**. A small part of the activated sludge is pumped back into the aeration tank to serve as bacterial inoculum. The remaining major part of the sludge is pumped into large tanks called **anaerobic sludge digesters**. Here, methanogenic bacteria, which grow anaerobically, digest the bacteria and fungi present in the sludge.

Tertiary treatment

It is physico-chemical process. It involves disinfecting the water if it is to be used for domestic purposes. It is done by various methods such as reverse osmosis, treating with chlorine, ozone gas or perchlorate salts.

04. Microbes in Biofuels

Biofuels are fuels of biological origin, which are used for the production of heat and other forms of energy. The energy derived from the biofuels is called **bioenergy**. Biologically generated hydrogen, methane, ethanol, butanol and diesel are referred as biohydrogen, biomethane, bioethanol, biobutanol and biodiesel, respectively.