

## What are Microbes?

Microbes are microscopic organisms present everywhere in air, water, soil, food, inside our bodies, and even in extreme environments (extremophiles).

They grow on nutrient media forming colonies visible to the naked eye.

## Types of Microbes:

Bacteria

Fungi

Protozoa

Algae (minute plants)

Viruses

Viroids

Prions (proteinaceous infectious particles)

## What is Microbiology?

Micro means extremely small

Bio means life, study

Microbiology = Study of microorganisms

## Applications of Microbiology

Household food processing

Industrial product formation

Biogas production

Sewage treatment

Biocontrol

Biofertilizers

Bioremediation

Production of antibiotics, organic acids, enzymes

SCP (Single-Cell Protein)

Genetic engineering tools

Vaccines and pharmaceuticals

## Microbes in Household Products

### Lactic Acid Bacteria (LAB)

- LAB convert milk to curd by producing lactic acid.
- Acid causes coagulation and partial digestion of milk proteins.
- LAB improves nutritional quality: increases Vitamin B12.
- LAB prevents growth of harmful microbes → protects gut health.
- Fermentation of Idli & Dosa Batter

Fermented by bacteria.

$\text{CO}_2$  produced during fermentation → dough appears puffy.

### Bread Production

Baker's yeast (*Saccharomyces cerevisiae*) is used.

Produces  $\text{CO}_2$  → dough rises.

### Cheese Formation

Swiss cheese: *Propionibacterium shermanii* produces large holes due to  $\text{CO}_2$ .

Roquefort cheese: Aged using special fungi that give distinct flavor & texture.

### Microbes as Source of Food (SCP – Single Cell Protein)

SCP = microbial biomass used as protein-rich food.

Advantages:

High protein, low fat

Rich in B-complex vitamins

Fast growth rate

Grows on waste materials

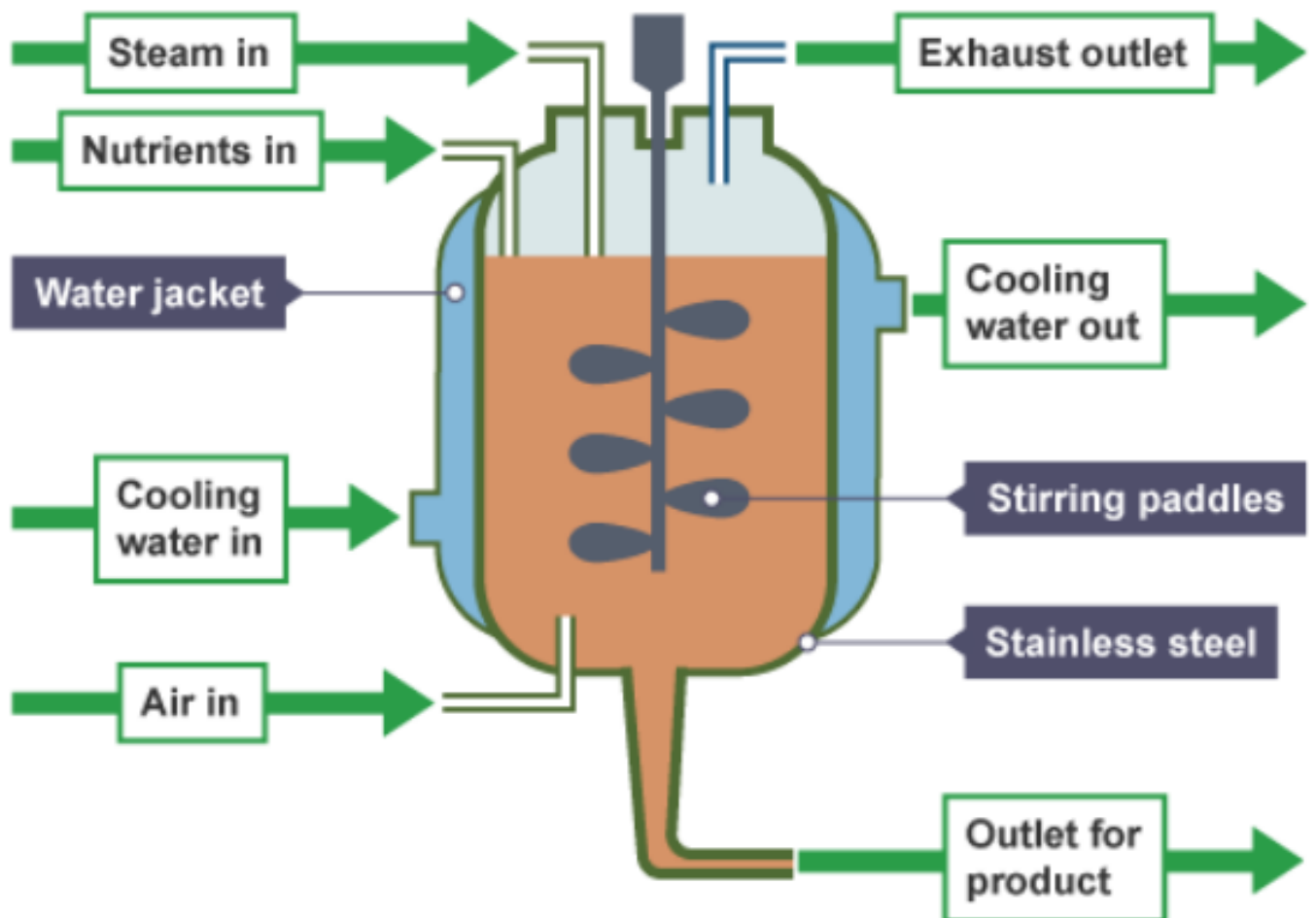
Example: Pruteen (SCP used for animal feed).

## 1. Household Products

| Microbe                            | Product          | Role                                                                      |
|------------------------------------|------------------|---------------------------------------------------------------------------|
| <b>Lactobacillus</b>               | Curd             | Converts lactose into lactic acid; lowers pH and coagulates milk protein. |
| <i>Saccharomyces cerevisiae</i>    | Bread, beverages | Ferments sugars; produces alcohol and CO <sub>2</sub> .                   |
| Microbes                           | Idli/dosa batter | Fermentation softens batter and improves nutritional quality.             |
| Yeast                              | Toddy            | Ferments palm sap.                                                        |
| <i>Propionibacterium shermanii</i> | Swiss cheese     | Produces CO <sub>2</sub> , forming holes.                                 |
| <i>Penicillium roqueforti</i>      | Roquefort cheese | Provides characteristic flavour and blue-green veins.                     |

## Microbes in Industrial Products

Microbes grown in large fermenters produce important products.



## Fermented Beverages

Yeast (*Saccharomyces cerevisiae* – Brewer's yeast) ferments sugar → ethanol.

Wine & Beer: No distillation.

Whisky, Rum, Brandy: Produced after distillation.

## Antibiotics

Antibiotics are chemical substances produced by microbes that kill or inhibit other microbes.

First antibiotic: Penicillin, discovered from *Penicillium notatum*.

RIZZING TALES

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| Antibiotic    | Source                           |
|---------------|----------------------------------|
| Terramycin    | <i>Streptomyces rimosus</i>      |
| Erythromycin  | <i>Streptomyces erythraeus</i>   |
| Chloromycetin | <i>Streptomyces venezuelae</i>   |
| Aureomycin    | <i>Streptomyces aureofaciens</i> |
| Neomycin      | <i>Streptomyces</i> spp.         |
| Penicillin    | <i>Penicillium notatum</i>       |
| Streptomycin  | <i>Streptomyces griseus</i>      |
| Actinomycetes | <i>Micromonospora</i> spp.       |

