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CHAPTER NOTES

Microbes in Human Welfare Class 12 Notes — CBSE Biology Chapter 10

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Microbes in Human Welfare Class 12 Notes — CBSE Biology Chapter 10

Chapter 10 — **Microbes in Human Welfare** — covers the beneficial uses of microorganisms in food, medicine, agriculture, and waste management. Carries **4-6 marks**. Learn the microbe-product-process connections.

Key Concepts

Microbes in Food Production

Product	Microbe	Process
Curd/Yogurt	Lactobacillus	Lactic acid fermentation of milk
Bread	Saccharomyces cerevisiae (yeast)	CO ₂ production → makes dough rise
Cheese (Swiss)	Propionibacterium shermanii	Large holes due to CO ₂
Cheese (Roquefort)	Penicillium roqueforti	Ripening, specific flavour
Toddy (palm wine)	Yeast (natural)	Fermentation of palm sap
Idli/Dosa	Leuconostoc mesenteroides	Fermentation of rice-dal batter

Microbes in Industrial Products

Product	Microbe	Use
Ethanol	<i>Saccharomyces cerevisiae</i>	Beverages, fuel, solvent
Citric acid	<i>Aspergillus niger</i>	Food preservative, flavouring
Acetic acid	<i>Acetobacter aceti</i>	Vinegar production
Butyric acid	<i>Clostridium butylicum</i>	Industrial chemical
Lactic acid	<i>Lactobacillus</i>	Food industry
Streptokinase	<i>Streptococcus</i>	Clot buster (removes blood clots)
Cyclosporin A	<i>Trichoderma polysporum</i>	Immunosuppressant (organ transplant)
Statins	<i>Monascus purpureus</i>	Lowers blood cholesterol

Antibiotics

Penicillin — discovered by Alexander Fleming (1928) from *Penicillium notatum*

First antibiotic; revolutionised medicine; full-scale production by Ernst Chain and Howard Florey

Microbes in Sewage Treatment

Primary treatment: Physical — filtration, sedimentation → primary sludge + effluent

Secondary treatment (Biological): Effluent + aerobic microbes in aeration tank → BOD decreases

→ Settling tank → activated sludge (some recycled) + effluent

Anaerobic sludge digester: Anaerobic bacteria → biogas ($\text{CH}_4 + \text{CO}_2 + \text{H}_2\text{S}$)

BOD (Biochemical Oxygen Demand): Amount of O_2 needed by microbes to decompose organic matter. High BOD = more pollution.

Microbes in Biogas Production

- **Methanogens** (e.g., *Methanobacterium*) produce methane anaerobically
- Found in cattle dung (gobar gas plant) and sewage digesters

- Biogas = $\text{CH}_4 + \text{CO}_2 + \text{H}_2$ — used as fuel in rural India
- IARI and KVIC developed biogas technology in India

Microbes as Biocontrol Agents

Agent	Target
Bacillus thuringiensis (Bt)	Insect pests (produces Bt toxin — also basis for Bt crops)
Trichoderma	Plant pathogens (fungi)
Baculoviruses (NPV)	Insects (narrow host range — species-specific)
Ladybird beetle (Coccinella)	Aphids

Microbes as Biofertilisers

Organism	Function
Rhizobium	Nitrogen fixation (symbiotic, in root nodules of legumes)
Azospirillum, Azotobacter	Free-living N_2 fixers
Anabaena, Nostoc	Cyanobacteria — N_2 fixation in paddy fields
Mycorrhiza (Glomus)	Fungi — help absorb phosphorus from soil

Quick Revision Points

- Curd: Lactobacillus; Bread: yeast; Swiss cheese: Propionibacterium
- Penicillin: Penicillium notatum (Fleming); Cyclosporin: Trichoderma; Statins: Monascus
- Sewage: primary (physical) → secondary (biological, reduces BOD) → anaerobic digestion → biogas
- BOD: higher = more pollution
- Biogas: methanogens (Methanobacterium); cattle dung; KVIC/IARI
- Biocontrol: Bt, Trichoderma, Baculovirus, ladybird beetle
- Biofertilisers: Rhizobium (legume N_2 -fixation), Mycorrhiza (phosphorus absorption)



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