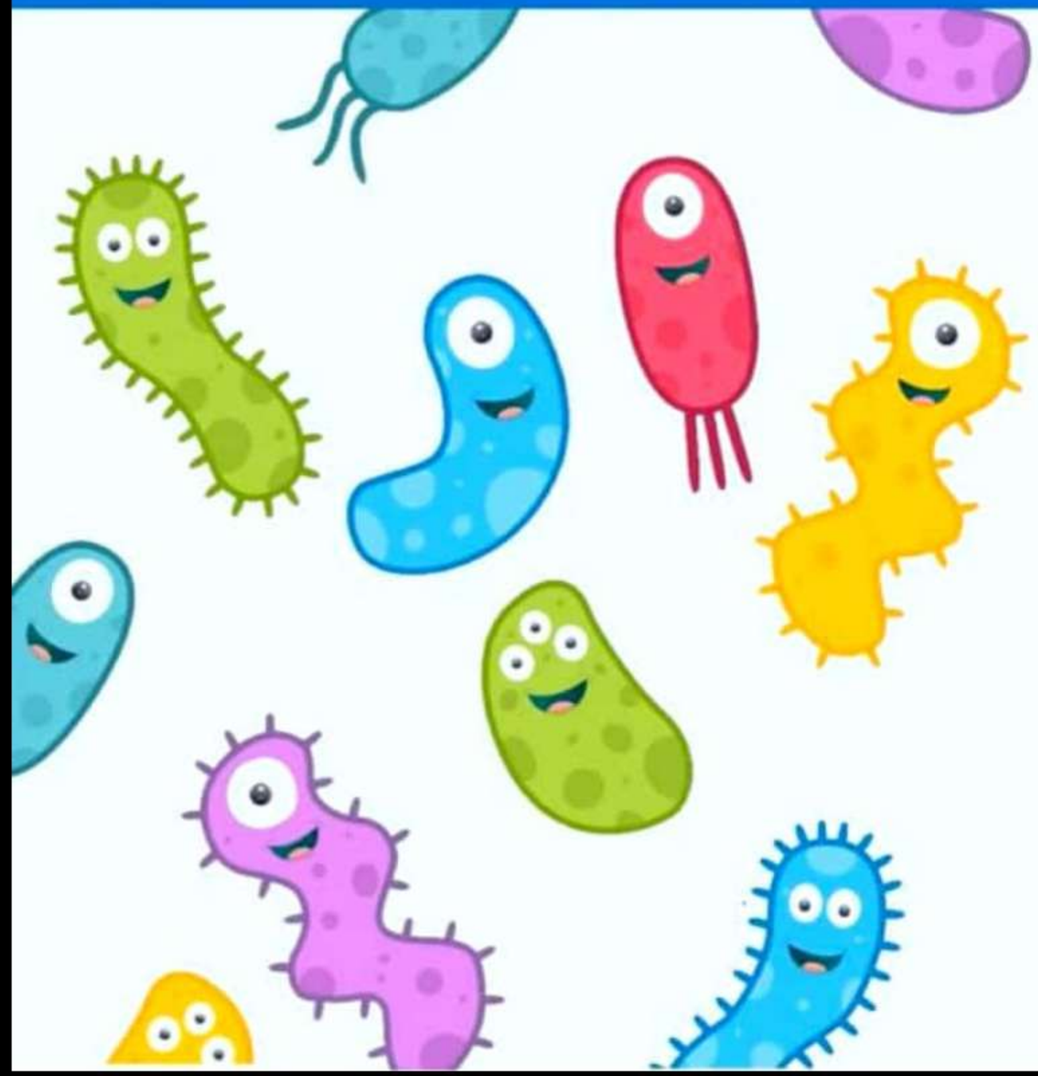
Topics to be discussed

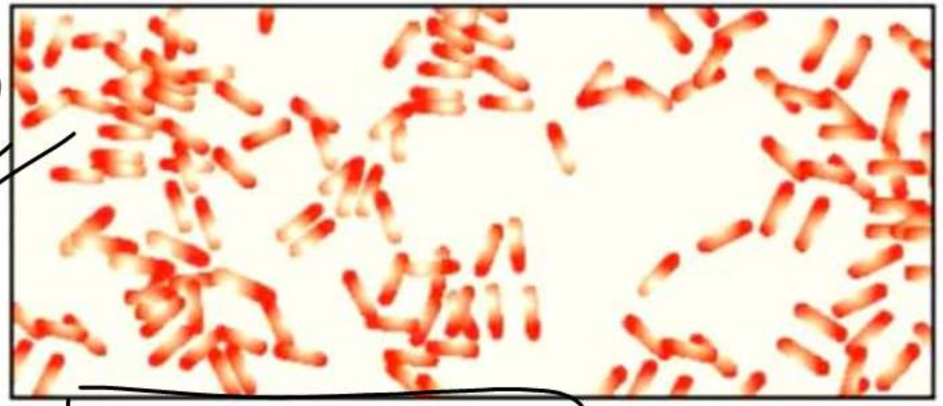


* Microbes: "Friends as well as Foe"

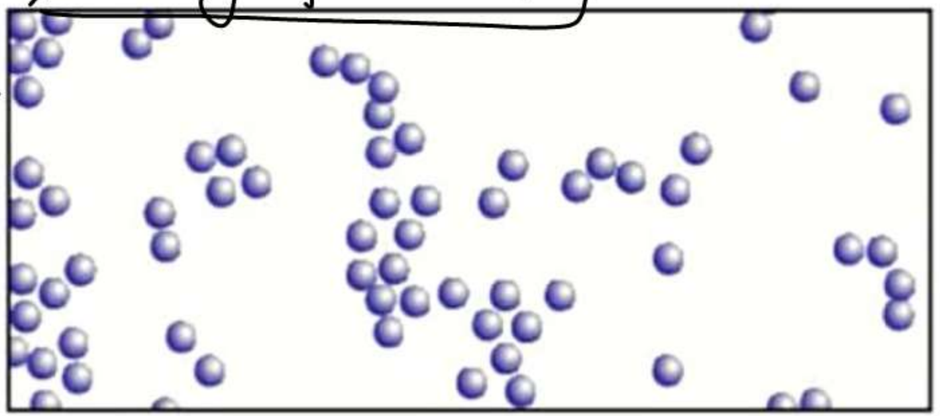
1. MICROBES IN HOUSEHOLD PRODUCTS
2. MICROBES IN INDUSTRIAL PRODUCTS
3. MICROBES IN SEWAGE TREATMENT
4. MICROBES IN BIOGAS PRODUCTION
5. MICROBES AS BIOCONTROL AGENTS
6. MICROBES AS BIOFERTILISERS

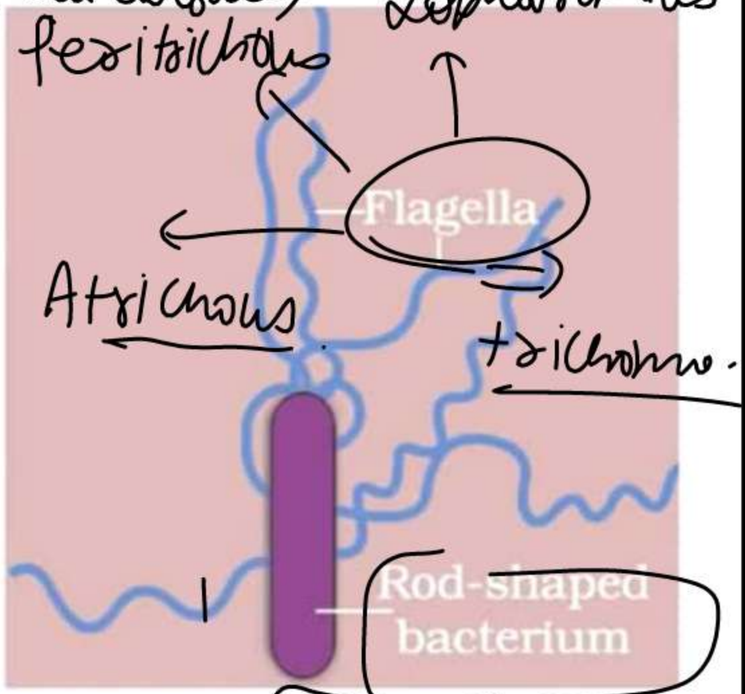
Various Microbes

Bacteria: Rod-shaped, magnified 1500X



Bacteria: Spherical shaped, magnified 1500X

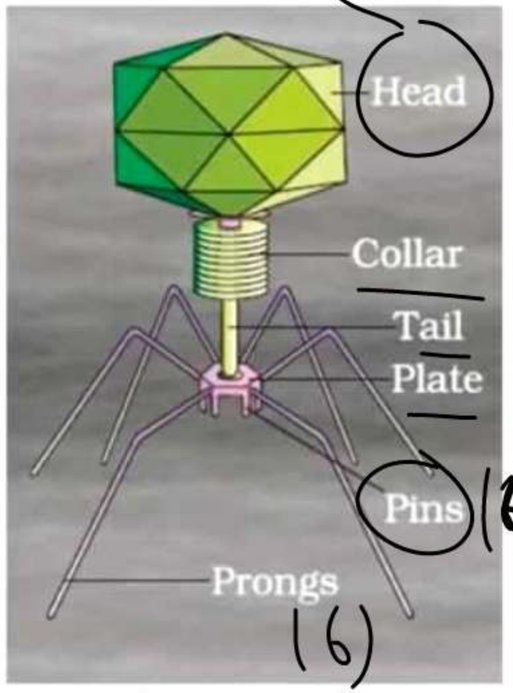




A rod-shaped bacterium showing flagella, magnified 50,000X

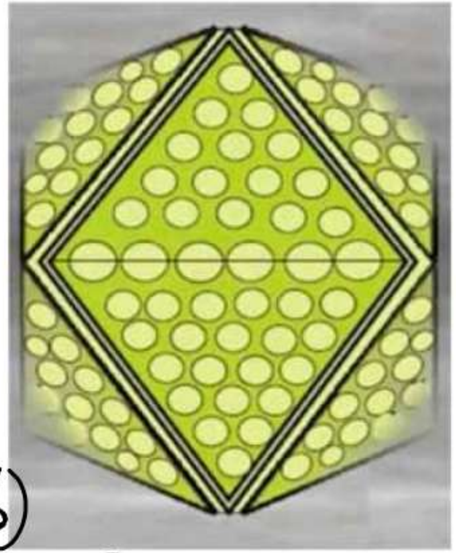
Various Microbes

Polygonal head (Dymmy)



A bacteriophage

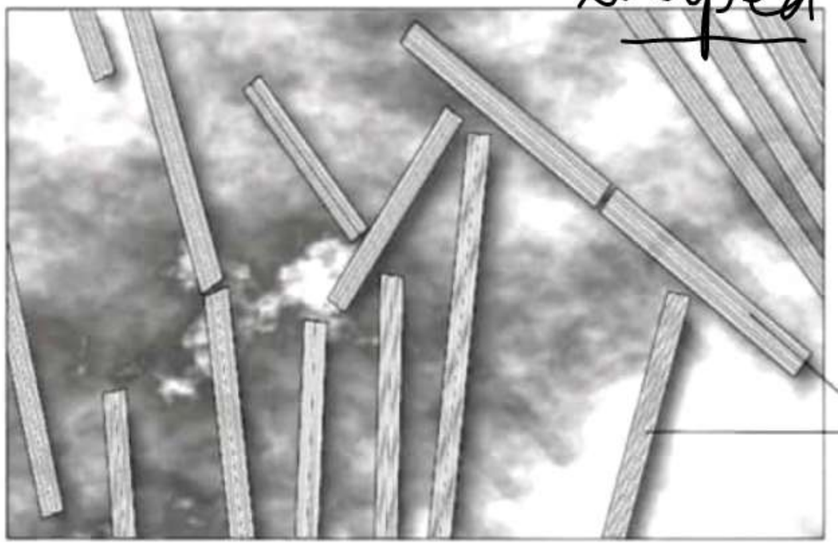
↳ Bacterial "virus"



Adenovirus which causes respiratory infections

Mosaic disease of tobacco.

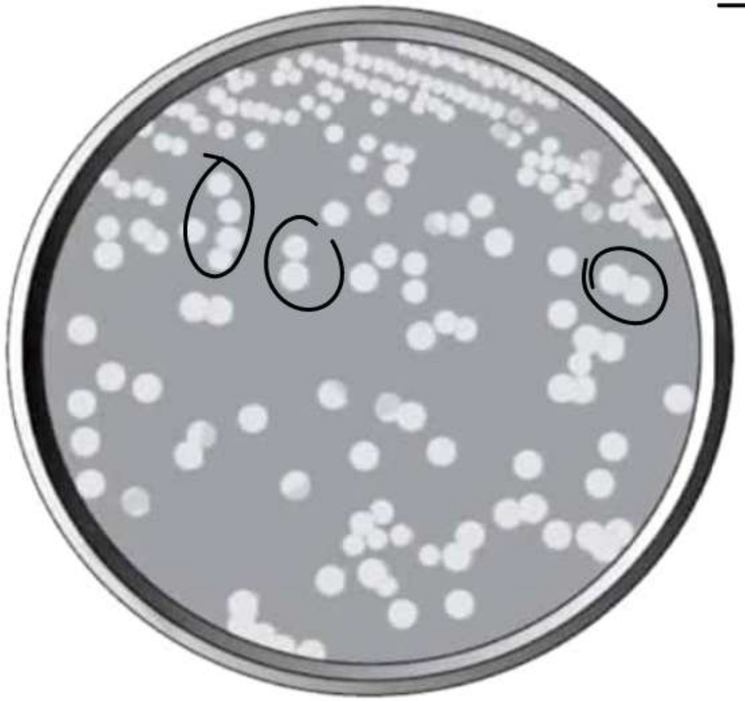
TMV: Compact, Rod shaped



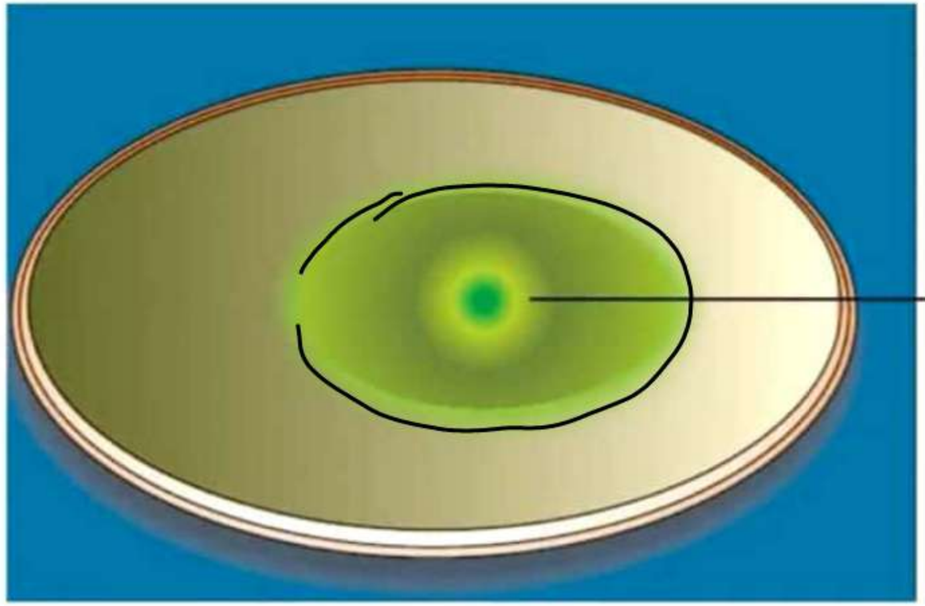
Rod-shaped Tobacco Mosaic Virus (TMV). Magnified about 1,00,000–1,50,000X

Various Microbes

"Lab Colonies"



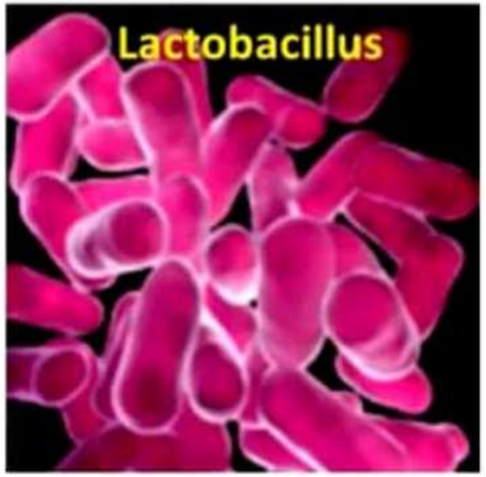
Colonies of bacteria growing in a petri dish



Fungal colony growing in a petri dish

MICROBES IN HOUSEHOLD PRODUCTS

Lactobacillus or Lactic acid bacteria (LAB)



- It converts milk to curd by producing acids that coagulate and partially digest the milk proteins.
- Fresh milk can be converted to curd by adding some curd containing LAB. It also increases vitamin B_{12}.
- In stomach, LAB helps to check pathogens.

MICROBES IN HOUSEHOLD PRODUCTS

- **Bacterial Fermentation (Anaerobic respiration) in dough is used to make foods such as *dosa, idli* etc.**
- **Puffed up appearance of dough is due to the production of CO_2 gas.**

MICROBES IN HOUSEHOLD PRODUCTS

Brewer's Yeast

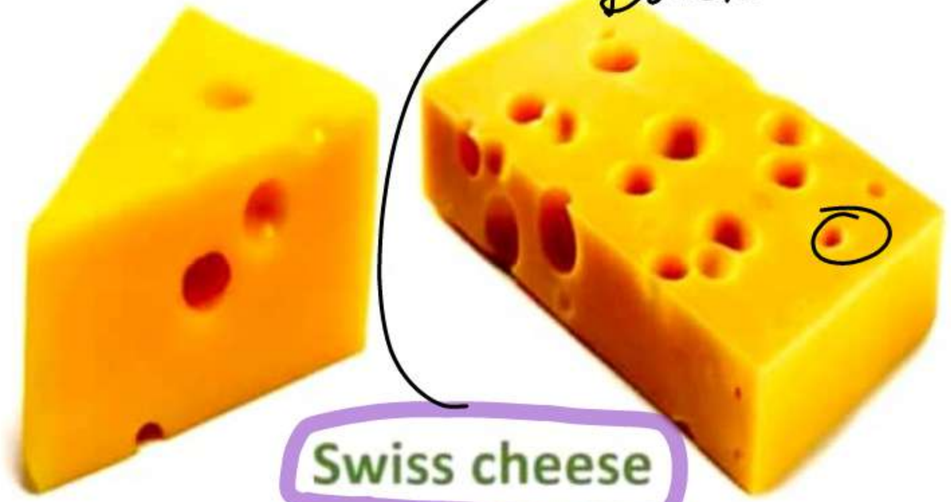
- **Baker's Yeast (*Saccharomyces cerevisiae*): It is used to make bread by fermenting dough.**

MICROBES IN HOUSEHOLD PRODUCTS

Achaar (Pickle)

- **Toddy** is made by fermenting sap from palms.
- Microbes are used to ferment fish, soya bean & bamboo-shoots and to produce cheeses.

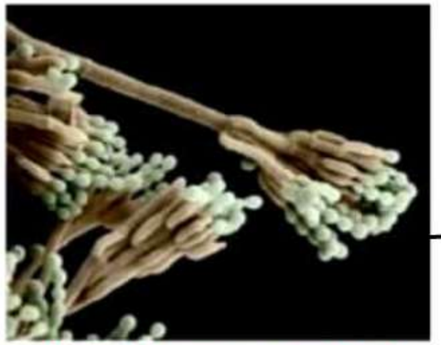
MICROBES IN HOUSEHOLD PRODUCTS



Swiss cheese

Roquefort cheese

Propionibacterium sharmanii



Penicillium roqueforti

- **Swiss cheese** has large holes due to production of CO_2 by ***Propionibacterium sharmanii*** (a bacterium).
- **'Roquefort cheese'** is ripened by growing a fungus (***Penicillium roqueforti***) on them.

MICROBES IN INDUSTRIAL PRODUCTS

Production of beverages, antibiotics etc. on an industrial scale, requires growing microbes in very large vessels (fermentors).

MICROBES IN INDUSTRIAL PRODUCTS

Fermented beverages

Wine & Beer

- *Saccharomyces cerevisiae (Brewer's yeast)* is used in the production of beverages by fermenting malted cereals and fruit juices to produce ethanol.
- Wine & beer are produced without distillation.
- Whisky, Brandy, Rum, Gin, Arrack etc. are produced by distillation of fermented broth.

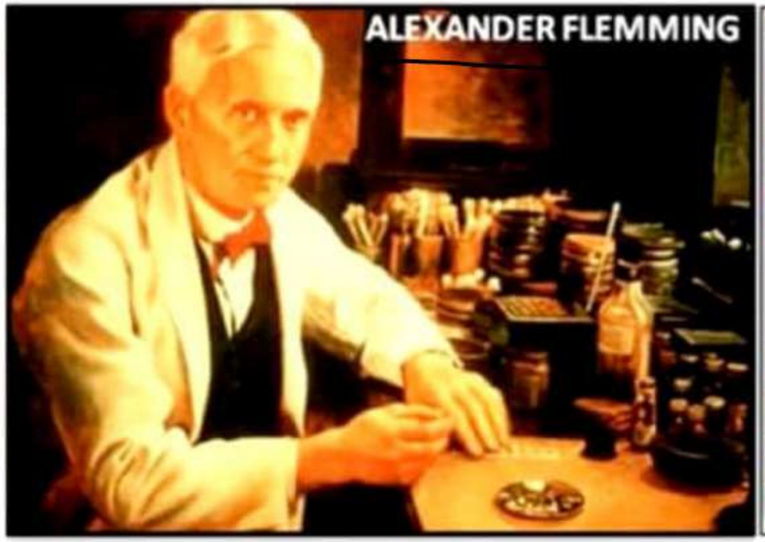
MICROBES IN INDUSTRIAL PRODUCTS

Antibiotics

- Antibiotics are chemical substances produced by some microbes and can kill or retard the growth of pathogens.
- Used to treat plague, whooping cough, diphtheria, leprosy etc.

MICROBES IN INDUSTRIAL PRODUCTS

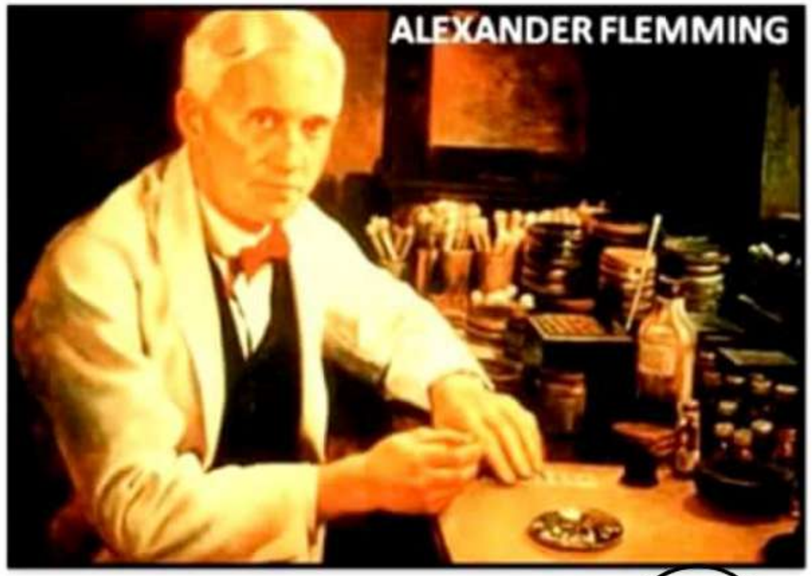
Antibiotics



- Penicillin: First antibiotic discovered by Alexander Fleming.
- He observed that *Staphylococci* could not grow around a mould (*Penicillium notatum*) growing in unwashed culture plates. He extracted penicillin from it.

MICROBES IN INDUSTRIAL PRODUCTS

Antibiotics



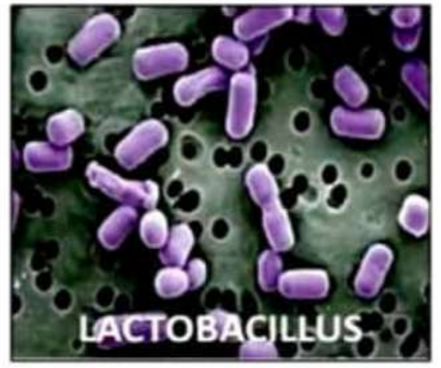
- **Earnest chain & Howard Florey established its full potential as an effective antibiotic.**
- **Fleming, Chain & Florey were awarded Nobel Prize (1945).**

MICROBES IN INDUSTRIAL PRODUCTS

Chemicals, Enzymes and other Bioactive molecules

1. Organic acids: Acid producer microbes include

Microbe	Organic acid
1. *Aspergillus niger* (a fungus)	Citric acid
2. *Acetobacter aceti* (a bacterium)	Acetic acid
3. *Clostridium butylicum* (a bacterium)	Butyric acid
4. *Lactobacillus* (a bacterium)	Lactic acid



MICROBES IN INDUSTRIAL PRODUCTS

Chemicals, Enzymes and other Bioactive molecules

2. **Alcohol:** Yeast (*S. cerevisiae*) is used to produce ethanol.
3. **Enzymes:**
   - **Lipases:** Used in detergent formulation. Help to remove oily stains from laundry.

Match List-I with List-II

[NEET-2021]

List-I	List-II
(a) Aspergillus Niger	(i) Acetic Acid
(b) Acetobacter aceti	(ii) Lactic Acid
(c) Clostridium butylicum	(iii) Citric Acid
(d) Lactobacillus	(iv) Butyric Acid

Choose the correct answer from the option given below:

	(a)	(b)	(c)	(d)
(A)	(ii)	(iii)	(i)	(iv)
(B)	(iv)	(ii)	(i)	(iii)
(C)	(iii)	(i)	(iv)	(ii)
(D)	(i)	(ii)	(iii)	(iv)

Which one of the following pairs is wrongly matched? [AIPMT-2007]

(A) Methanogens – Gobar gas

(B) Yeast – Ethanol

(C) Streptomycetes – Antibiotic

(D) Coliforms – Vinegar

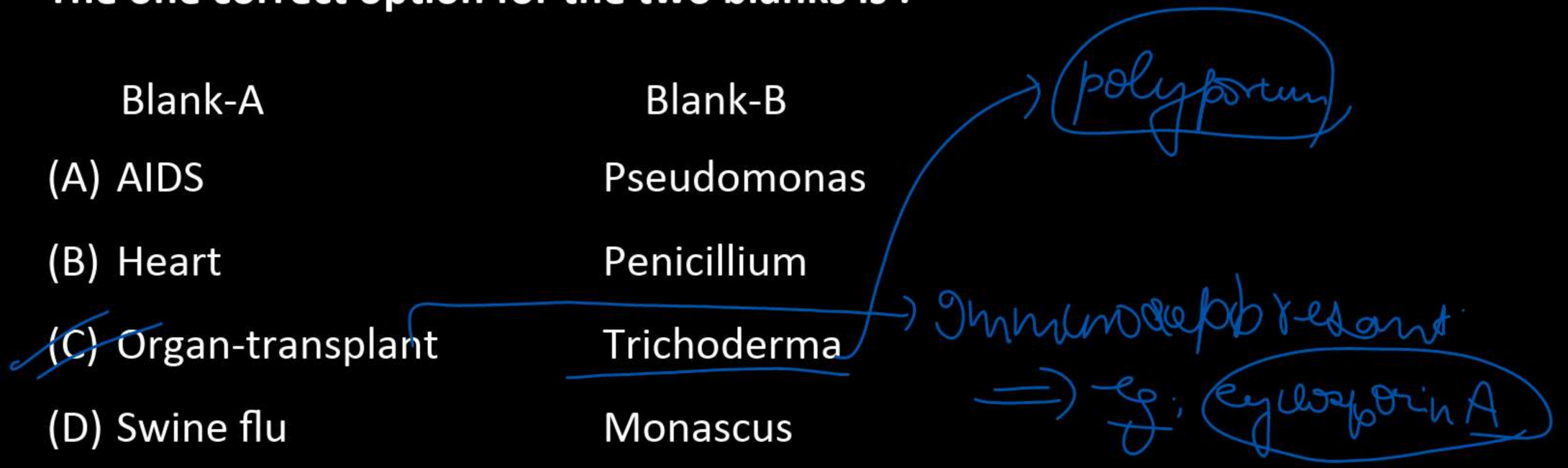
↳ E. coli (Escherichia coli)

Read the following statement having two blanks (A and B) : [AIPMT-2011]

"A drug used for ____(A)____ patients is obtained From a species of the organism ____(B)____".

The one correct option for the two blanks is :

	Blank-A	Blank-B
(A)	AIDS	Pseudomonas
(B)	Heart	Penicillium
(C)	Organ-transplant	Trichoderma
(D)	Swine flu	Monascus



A patient brought to a hospital with myocardial (MI) infarction is normally immediately given [AIPMT-2012]

(A) Penicillin ✗ → Clot buster.

(B) Streptokinase

(C) Cyclosporin-A ✗

(D) Statins → blood cholesterol lowering agent.

Which of the following is wrongly matched in the given table? [NEET-2016]

	Microbe	Product	Application
(A)	Monascus purpureus	Statins	Lowering of blood cholesterol
(B)	Streptococcus	Streptokinase	Removal of Clot from blood vessel
(C)	Clostridium butylicum	Lipase / Butyric Acid	Removal of oil stains
(D)	Trichoderma polysporum	Cyclosporin-A	Immunosuppress

Match column I with column II and select the correct option using the codes given below

Column I	Column II
(a) Citric acid	1. Trichoderma
(b) Cyclosporin	2. Clostridium
(c) Statins	3. Aspergillus
(d) Butyric Acid	4. Monascus

(A) a-3 b-1 c-2 d-4
(B) ~~a-3 b-1 c-4 d-2~~
(C) a-1 b-4 c-2 d-3
(D) a-3 b-4 c-1 d-2

Which of the following is a commercial blood cholesterol lowering agent? [NEET-2019]

(A) Lipase

(B) Cyclosporin A

(C) Statin

(D) Streptokinase → Clot buster

Cyclosporin A, used as an immuno suppression agent, is produced from [NEET-2020]

(A) Monascus purpureus → statin

(B) Saccharomyces cerevisiae

(C) Penicillium notatum

(D) Trichoderma polysporum

For the commercial and industrial production of citric acid, which of the following microbes is used? [NEET-2020]

(A) Aspergillus niger

(B) Lactobacillus sp

(C) Saccharomyces cerevisiae

(D) Clostridium bretylium

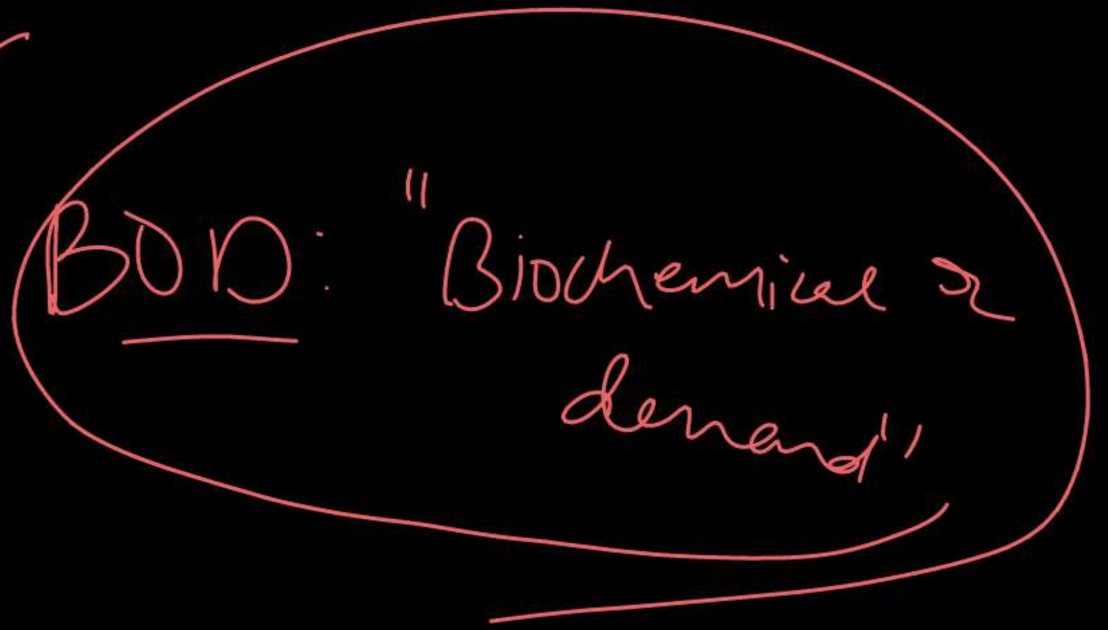
BOD of waste water is estimated by measuring the amount of:

(A) Total inorganic matter

(B) Biodegradable organic matter

(C) Oxygen evolution

(D) Oxygen consumption.



The residue left after methane production from cattle dung is:

→ NEET-

(A) Burnt

(B) Burried in land fills

(C) Used as manure (खाद)

(D) Used in civil construction

Which one of the following alcoholic drinks is produced without distillation ?

(A) Wine & Beer

(B) Whisky

(C) Rum

(D) Brandy

→ Distillation (Conc^{n} > 40%)

The vitamin whose content increase following the conversion of milk into curd by lactic acid bacteria is:

AIPMT.

(A) Vitamin C

(B) Vitamin D

(C) Vitamin B12 → Cyano "Cobalamin"

(D) Vitamin E

Vitamin: H → Biotin

Big holes in Swiss cheese are made by a:

AIPMT – 1998

(A) A machine

(B) A bacterium that produce methane gas

(C) A bacterium producing a large amount of carbon dioxide

(D) A fungus that releases a lot of gases during its metabolic activites.

The maximum concentration of alcohol in beverages that are naturally fermented is: (without distillation)

R-PMT*

(A) 5 – 10%

(B) 10 – 15%

(C) 20 – 25%

(D) 45 – 50% (Distillation)

Microorganisms are used during which stage of the purification of the sewage water?

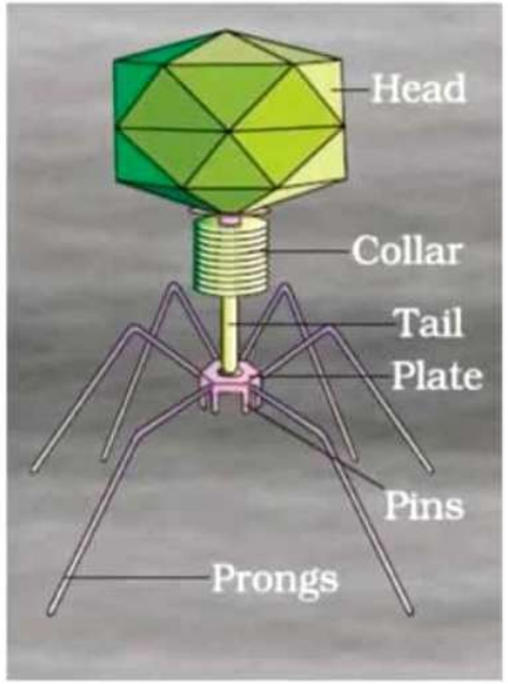
(A) Primary treatment

(B) Secondary treatment

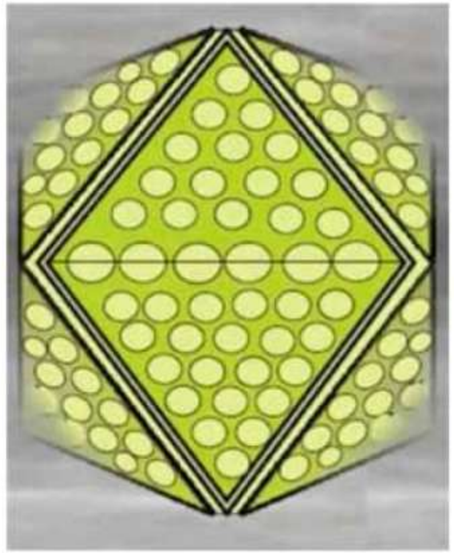
(C) None of the above

(D) Both (A) and (B)

Various Microbes



A bacteriophage

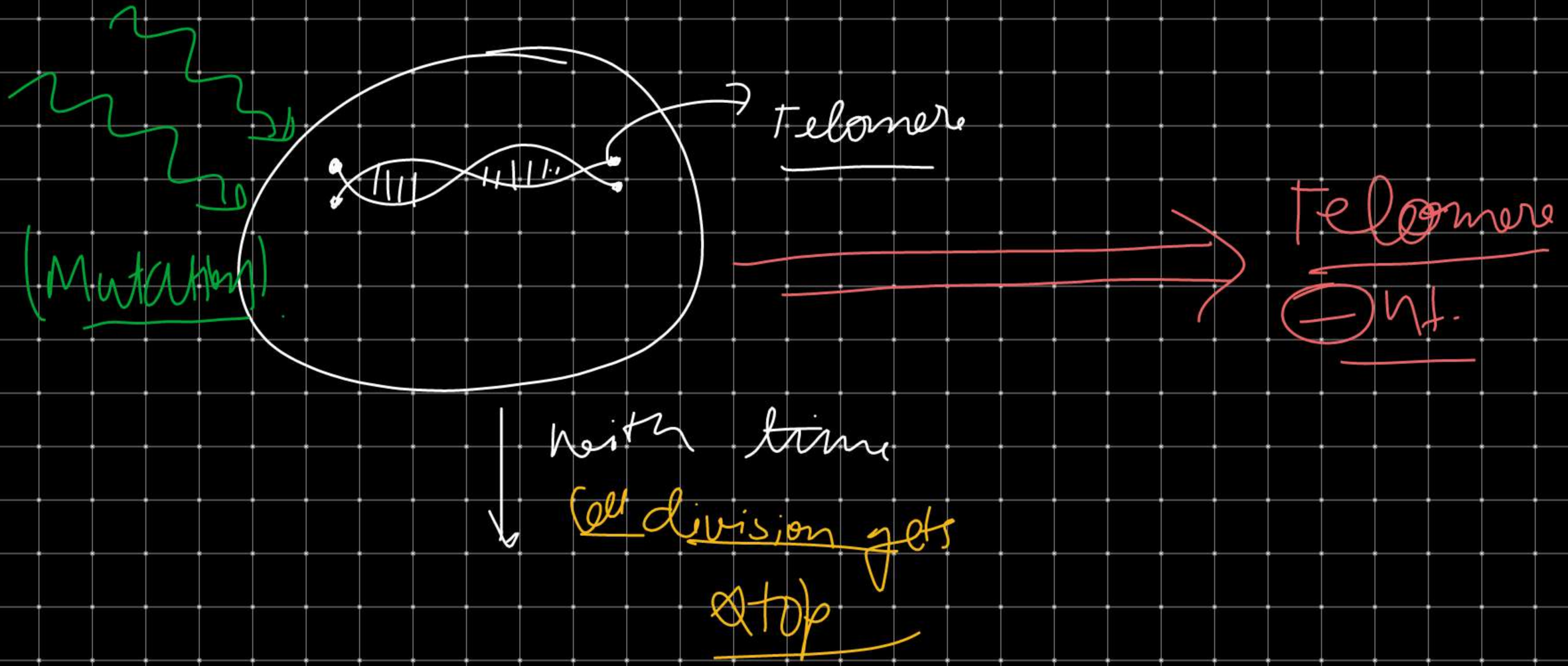


Adenovirus which causes respiratory infections

Rod-shaped Tobacco Mosaic Virus (TMV). Magnified about 1,00,000–1,50,000X

① Microbes (Bacteria, Fungus) ⇒ Organic acids.

(Inorganic acids ✗)


Telomere
(Mutation)
Telomere
Shrt.
with time
Cell division gets
stop