ECONOMIC IMPORTANCE OF BACTERIA

HARMFUL ACTIVITIES

1. Disease in Human beings :

Diseases		Bacterium
Tuberculosis (T.B.)	-	***Mycobaterium tuberculosis***
Leprosy	-	***Mycobacterium leprae***
Diphtheria	-	***Corynebacterium diphetheriae***
Tetanus	-	***Clostridium tentani***
Typhoid	-	***Salmonella typhi***
Plague	-	***Pasteurella pestis or Yersinia pestis***
Pneumonia	-	***Diplococcus pneumoniae or Pneumococcus pneumoniae***
Jaundice	-	***Leptospira ictero***
Pertussis	-	***Bordetella pertussis***
Meningitis	-	***Neisseria meningitidis***
Gonorrhoea	-	***Neisseria gonorrhoeae***
Cholera	-	***Vibrio cholerae***
Dysentery	-	***Shigella dysenteriae***
Syphilis	-	***reponema pallidum***

2. Disease in Animals -

Anthrax	-	***Bacillus anthracis***
Black leg	-	***Clostridium chanvei***

3. *Disease in plants -*

Citrus canker	-	***Xanthomonas citri***
Leaf blight of rice	-	***Xanthomonas oryzae***
Leaf streak of rice	-	***Xanthomonas oryzicola***
Angular leaf spot of cotton	-	***Xanthomonas malvacearum***
Crown gall in many plants	-	***Agrobacterium tumefaciens***
Fire blight of stone fruit (apple and peas)	-	***Erwinia amylovora***
Brown rot or wilt of potatoes	-	***Pseudomonas solanacearum***
Black leg and soft rot of potato	-	***Erwinia caratovora atroseptica***
Bacterial leaf blight of rice	-	***Xanthomonas oryzae***

4. Denitrification - Denitrifying bacteria -

Some bacteria convert soil nitrates into nitrites and then nitrogen. These bacteria reduce the fertility of soil.

e.g. Thiobacillus denitrificans, Pseudomonas denitrificians

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5. Food poisoning -

Some bacteria are responsible for food poisoning. These are of three types -

A. *Salmonella enteridid* - These bacteria survive on milk products and also in intestine of man. They secrete toxins.
symptoms - Vomiting, Dysentrey

B. *Staphylococcus oaureus* - These bacteria survive on milk and egg products. They secrete toxins which damage the central nervous system. These toxin are heat resistant.

C Botulism - *Clostridium botulinum* - It is most lethal type of food poisoning. These bacteria survive in absence of O_2. These bacteria grow in canned food. Their toxins damage the parasymphetic nervous system. It leads to paralysis of both smooth and striped muscles, resulting in immediate death.

6. Water pollution -
Several bacterial forms cause water pollution. These bacteria spoil the water.
e.g. Vibrio cholerae Salmonella typhi, Shigella dysenteriae.

7. Biological Weapons - Some bacteria are used as bio weapons such as **Anthrax causing, Botulism, Cholera causing bacteria.**

USEFUL ACTIVITIES

1. Ammonification - Ammonifying bacteria -
Some bacteria convert Protein (present in decaying plants & animals) into Ammonia.
e.g. Bacillus vulgaris, Bacillus mycoides, Bacillus ramosus

2. Nitrification - Nitrifying bacteria -
These bacteria convert Ammonia in to Nitrite and later into Nitrate.

$$NH_3 \xrightarrow{\text{Nitrosomonas}} NO_2 \text{ (Nitrite)} \xrightarrow{\text{Nitrobacter}} NO_3 \text{ (Nitrate)}$$

3. Nitrogen fixation - Nitrogen fixing bacteria -
These bacteria convert the atmospheric nitrogen into nitrogenous compounds like amino acids. nirate or ammonium salts.
Nitrogen fixation is done by two methods –

(A) Symbiotically - Some bacteria live symbiotically and do nitrogen fixation.
e.g. *Rhizobium - In the root nodules of legumes*
Aerorhizobium - In the stem nodules of sesbania
Azospirillum - In root nodules of cereals (eg. Wheat, Rice, Maize).
Frankia - In root nodules of non leguminous plant Casurina and root nodules and Alnus plant.

(B) Asymbiotically - Some bacteria occur free in soil and do nitrogen fixation.
e.g. *Clostridium, Chromatium, Azotobacter, Rhodomicrobium, rhodospirillum, Rhodopseuomons*

4. Dairy products -
Diary products are formed with the help of bacterial fermentation.

A Curd - It is made by milk.

$$\text{Milk} \xrightarrow[\textit{Lactobacillus lactis}]{\textit{Streptococcus lactis or}} \text{Curd}$$

B. Butter - It is made by churning cream that has been soured by lactic acid bacteria ***Streptococcus*** *lactis or Streptococus cremoris.*

$$\text{Milk} \xrightarrow[\text{mechanical method}]{\text{Direct formation by}} \text{Churning cream} \xrightarrow[\text{Streptococcus cremoris}]{\text{Streptococcus lactis or}} \text{Butter}$$

Leuconostoc citrovorm provides flavours to it.

C. Yoghurt - It is made by fermenting milk with a mixture of *Lactobacillus bulgaricus* and *Streptococcus thermophilus.*

$$\text{Milk} \xrightarrow{\text{Streptococcus lactis}} \text{fermented milk} \xrightarrow[\text{Streptococcus thermophilus}]{\text{Lactobacillus bulgaricus +}} \text{Yoghurt}$$

D. Cheese - It is made by curd with the help of *Streptococcus lactis* and *Lactobacillus lactis.*

$$\text{Milk} \xrightarrow{\text{Streptococcus lactis}} \text{Curd} \xrightarrow[\text{Streptococcus lactis}]{\text{Lactobacillus lactis}} \text{Cheese}$$

5. Antibiotics -

- Term antibiotic was given by **S.A. Waksman**
- First discovered antibiotic was Penicillin it was obtained from fungi **Pencillium.**
- First discovered antibiotic from bacteria was **streptomycin.**
- Many antibiotic medicines are obtained from the bacteria.
- Some substances produced by microorganism which inhibit the growth of other micro-organism are called antibiotic substance.
- These antibiotic medicine cure the disease through the **completitive inhibition.**

	Bacteria		**Antibiotics**
1.	***Bacillus lincheniformis***	-	Bacitracin
2.	***Bacillus polymyxa***	-	Polymyxin
3.	***Bacillus brevis***	-	Gramicidin
4.	***Bacillus subtilis***	-	Subtilin & Bacitracin
5.	***Streptomyces griseus***	-	Streptomycin
6.	***Streptomyces uvenezuelae***	-	Choromycetin (chloramphenicol)
7.	***Streptomyces aureofaciens***	-	Auremycin (Chlorotetracycline) & Tetracylline
8.	***Streptomyces rimosus***	-	Terramycin (oxytentracycline)
9.	***Streptomyces fradiae***	-	Neomycin

6. Industries -

Many bacteria are used in industries

(A) Alcohol formation :

Ethanol is formed with the help of yeast (fungi) or bacteria (**Sarcina veutriculi**) by the process of fermentation.

$$C_6H_{12}O_6 \xrightarrow{Sarcina\ \ veutriculi} \text{Alcohol (Ethanol)}$$

(B) Vinegar formation (Acetic acid)-

Ethanol $\xrightarrow{\text{Acetobacter aceti}}$ Acetic acid

(C) Retting of fibres -

e.g. Clostridium, Butyric acid bacteria

(D) Flavouring of tea and tobacco leaves -

e.g. Bacillus megatherium, Micrococcus condiscence

(E) Cleaning of hides -

e.g. ***Any saprotrophic***

(F) Production of Vitamins -

- Clostridium butylicum produces $\longrightarrow$ Riboflavin (Vit. B_2)
- Propionibacterium and Bacillus megatherium produce - Vit. B_{12}
- E. coli produces $\rightarrow$ Vit, E., Vit. K. (**E. coli** bacteria found in alimentary canal of human beings)

(G) Butyric acid formation -

$C_6H_{12}O_6 \xrightarrow[\text{Fermentation}]{\text{Clostridium acetobutyilicum}}$ Butyric acid

7. **Decomposing bacteria -** Some bacteria decompose the harmful chemicals.
   - *Flavobacrerium - 2, 4 - D*
   - *Acetobacter* $\longrightarrow$ *DDT*
8. **Bacteria for specific pests -** Bacteria are use to kill specific pets

   e.g. *Bacillus popilliae - Japaneese Beetle*

   Bacillus spharicus – Anopherles
9. **Purity of Ganga water -** In Gangatic water a bacteria ***Bdellovibrio bacterovorus*** is found, it kill the other water pollutant bacteria.
10. **Pullution indicting bacteria :**

Water in which E. coli bacteria are present known as polluted water. Quality of water depends on number of *E. coli.* If *E. coli* are very much in no. the water will be highly polluted. So the *E. coli* is known as pollution indicating bacteria.

11. **Oil Clearing bacteria :**

eg. *Pseudomonas putida*

12. **Bacteria for genetic engineering -**

eg. *E. Coli and Agrobacterium*