

# Major groups of microorganisms

## सूक्ष्म जीवों के प्रमुख समूह part-1

Class-Bsc 1<sup>st</sup> year

Paper-1 (General microbiology and basic techniques)

Unit-1 (Fundamental ,history and development)

# What is Microbiology

- Microbiology is a branch of biology.
- The term “Microbiology” was introduced by French chemist Louis Pasteur.

Greek words

Mikros- small (छोटा/सूक्ष्म)

Bios- life (जीवन)

Logos/logy- science (विज्ञान,अध्ययन)

## Definition -:

**Microbiology is the study of living organisms of microscopic size.**

# Major groups of microorganisms

## सूक्ष्म जीवों के प्रमुख समूह

- ▶ Bacteria (जीवाणु)
- ▶ Virus (विषाणु)
- ▶ Fungi (कवक/फफूँद)
- ▶ Algae (शैवाल)
- ▶ Protozoa (प्रोटोज़ोआ)

# Bacteria

- ▶ **Introduction**
- ▶ **History**
- ▶ **Definition**
- ▶ **Occurance**
- ▶ **Morphology**
- ▶ **Common features**
- ▶ **Nutrition**
- ▶ **Importance of bacteria**

# Bacteria

## Introduction(परिचय)-:

- ▶ Bacteria have existed from very early in the history of life on Earth.(जीवाणु पृथ्वी पर जीवन के इतिहास में बहुत पहले से मौजूद हैं ।)
- ▶ A bacteria is a single celled organism.  
जीवाणु एककोशिकीय जीव होते हैं।
- ▶ The study of bacteria is known as bacteriology,a branch of microbiology.
- ▶ सूक्ष्म जीव विज्ञान की वह शाखा जिसके अन्तर्गत जीवाणुओं का अध्ययन किया जाता है ,जीवाणु विज्ञान कहलाता है।
- ▶ It's a field in which bacteriologist study and learn more about the various characteristics (structure,genetics, biochemistry and ecology etc.) of bacteria.

# History

- ▶ **Antony van Leeuwenhoek** (1677) was the first to observe microbes and called them animalcules.
- ▶ **Ehrenberg** (1838) introduced the term 'bacteria'.
- ▶ **Louis Pasteur** (1822-1895) discovered the principles of vaccination, fermentation and Pasteurization.
- ▶ **Robert Koch** (1843-1910) identified the specific causative agents of tuberculosis, cholera and anthrax.
- ▶ Tuberculosis (1882) - *Mycobacterium tuberculosis*
- ▶ Cholera (1883) - *Vibrio cholera*
- ▶ Anthrax (1876) - *Bacillus anthracis*
- ▶ **Ferdinand Cohn** (1876) studied the biology of bacilli.

## ▶ Father of microbiology- **Antony van Leeuwenhoek**

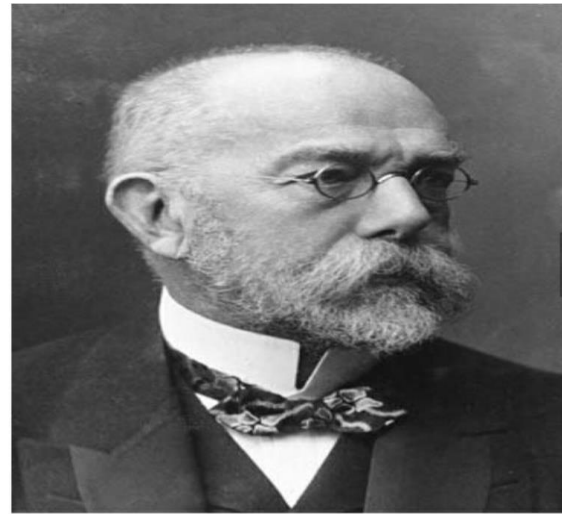


## ▶ Three main founders of bacteriology-

1. **Louis Pasteur**
2. **Robert Koch**
3. **Ferdinand Cohn (F.Cohn)**



Louis Pasteur in his laboratory, holding a jar containing the spinal cord of a rabbit infected with rabies, which he used to develop a vaccine against the disease.



Robert Koch.

*Photos.com/Thinkstock*



Definition(परिभाषा)-:

**Bacteria are single celled microorganisms with prokaryotic cells.**

**जीवाण एककोशिकीय सूक्ष्म जीव होते हैं।  
ये प्रोकैरियोटिक कोशिका होते हैं।**



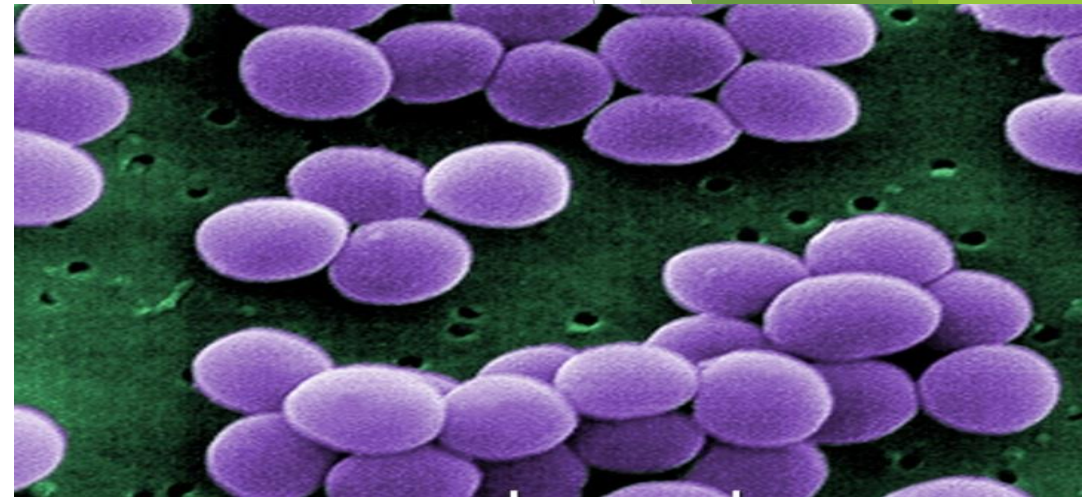
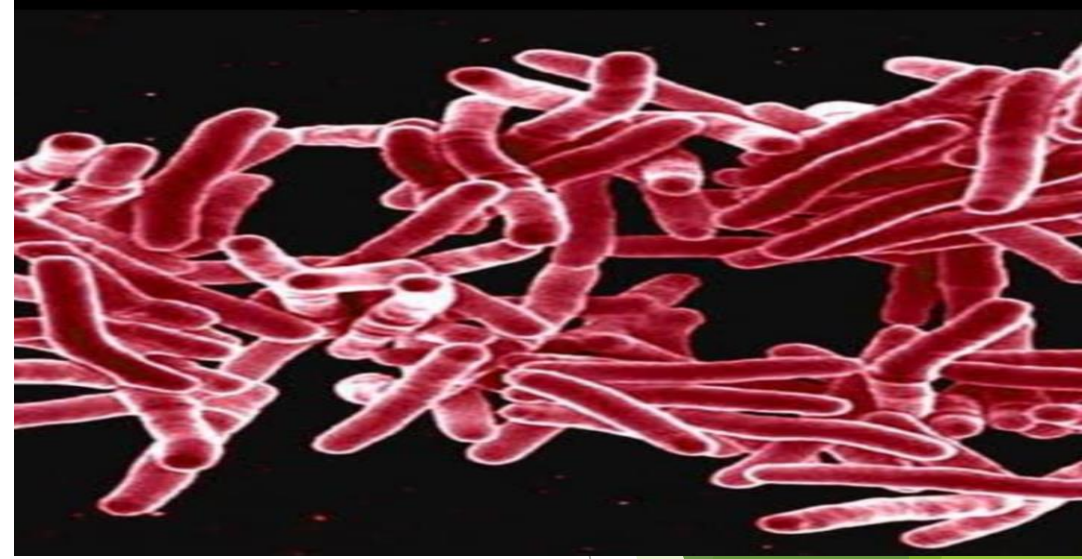
## Occurance (प्राप्तिस्थल)

Bacteria are ubiquitous in nature.

Bacteria in Air (वायु में पाये जाने वाले जीवाणु)

### Examples

- ▶ *Mycobacterium tuberculosis*,
- ▶ *Staphylococcus aureus*,
- ▶ *Corynebacterium diphtheria*



# Bacteri in Soil

मृदा में पाये जाने वाले  
जीवाणु

Examples-:

- ▶ *Bacillus*
- ▶ *Clostridium*
- ▶ *Nitrosomonas*
- ▶ *Nitrobacter*
- ▶ *Rhizobium*
- ▶ *Pseudomonas*

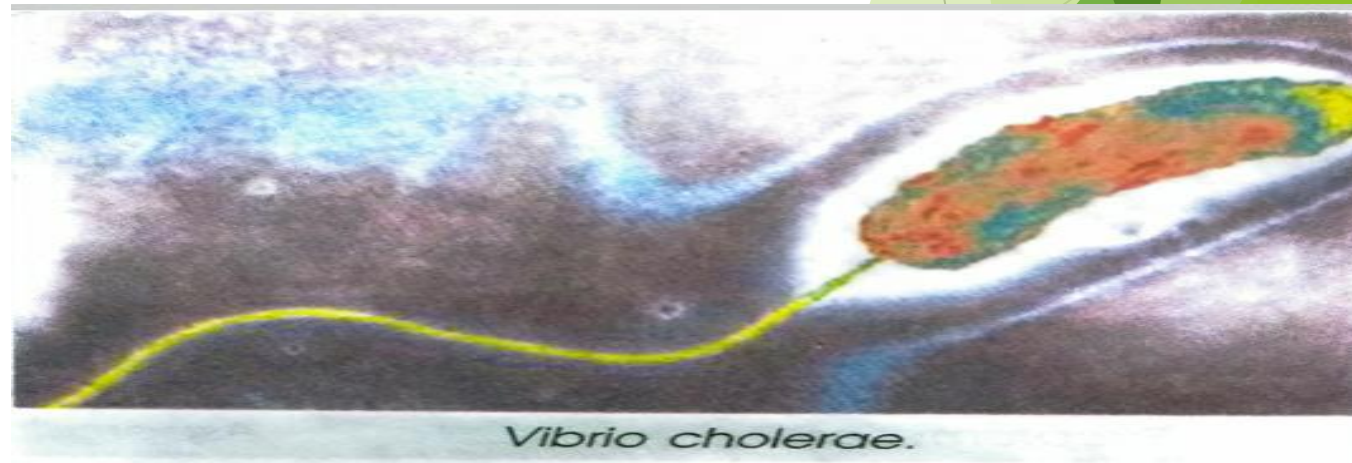
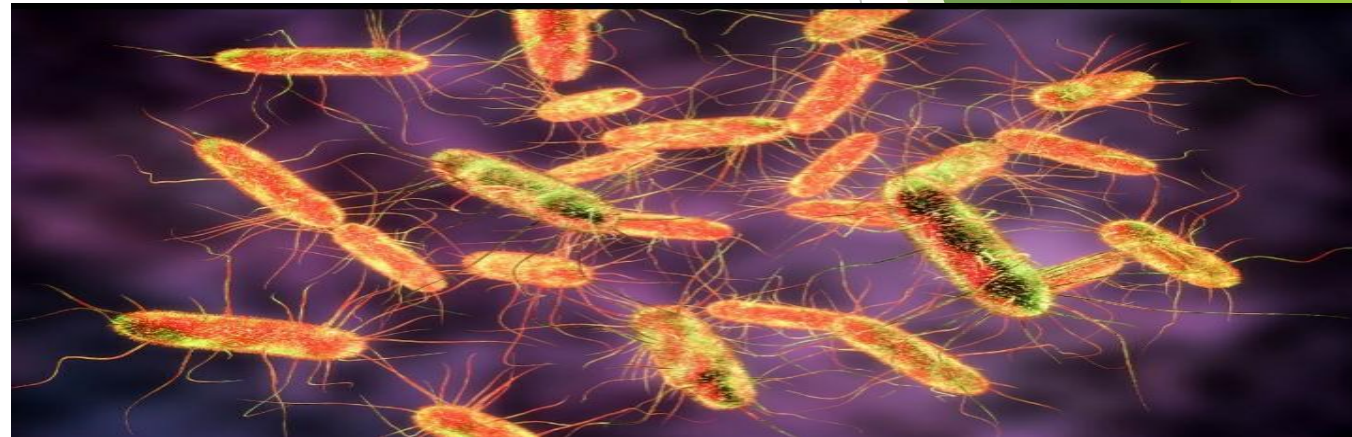


(a) Cells of *Pseudomonas*  
(cylindrical)

# Bacteria in Water जल में पाये जाने वाले जीवाणु

Examples-:

- ▶ *Escherichia coli*(E.coli)
- ▶ *Salmonella*
- ▶ *Vibrio Cholera*



# Bacteria found in human body

## मनुष्य के शरीर में पाये जाने वाले जीवाणु

### Examples

- ▶ *Staphylococcus aureus*
- ▶ *Lactobacillus*
- ▶ *Propionibacterium acnes*
- ▶ *E.coli*

### Site

- ▶ Nasal membranes, skin, hair follicles
- ▶ Mouth, intestinal tract
- ▶ Skin
- ▶ Lower part of the intestine

# Bacteria in radioactive Waste

## रेडियोधर्मी कचरे में पाए जाने वाले जीवाणु

### Radioactive waste

► Uranium

### Example

► *Geobacter*

# Bacteria in space (अंतरिक्ष में पाये जाने वाले जीवाणु)



Example

► *Solibacillus kalamii*

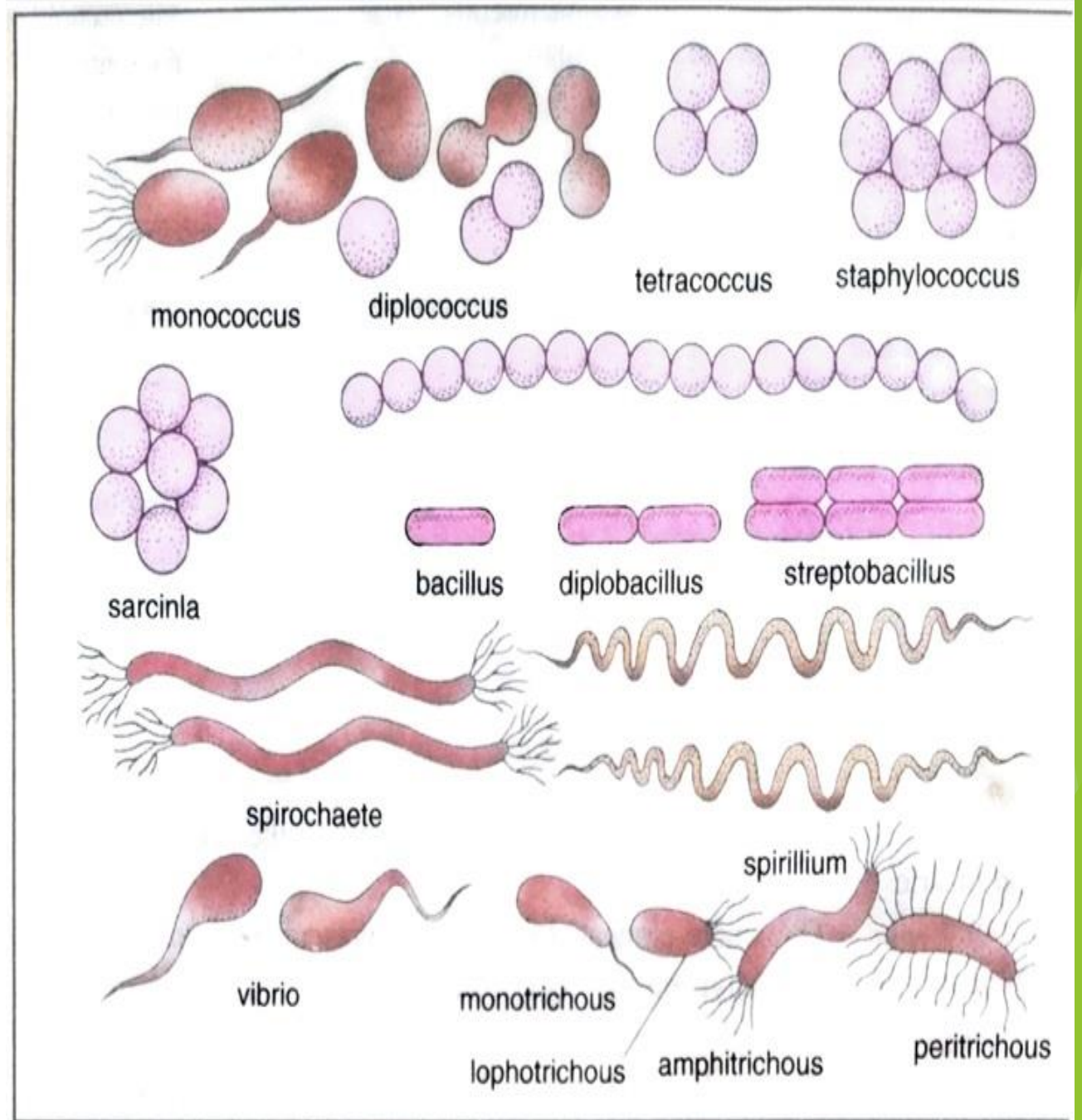
# Morphology of bacteria

- ▶ Morphology includes the size, shape and rearrangement of microbial cell.
- ▶ Size-: bacteria are very small organisms.  
Smallest bacteria- 0.1 micron in diameter  
Largest bacteria- 60×6 micron

# Shape

## ► Bacteria occur in three main shapes

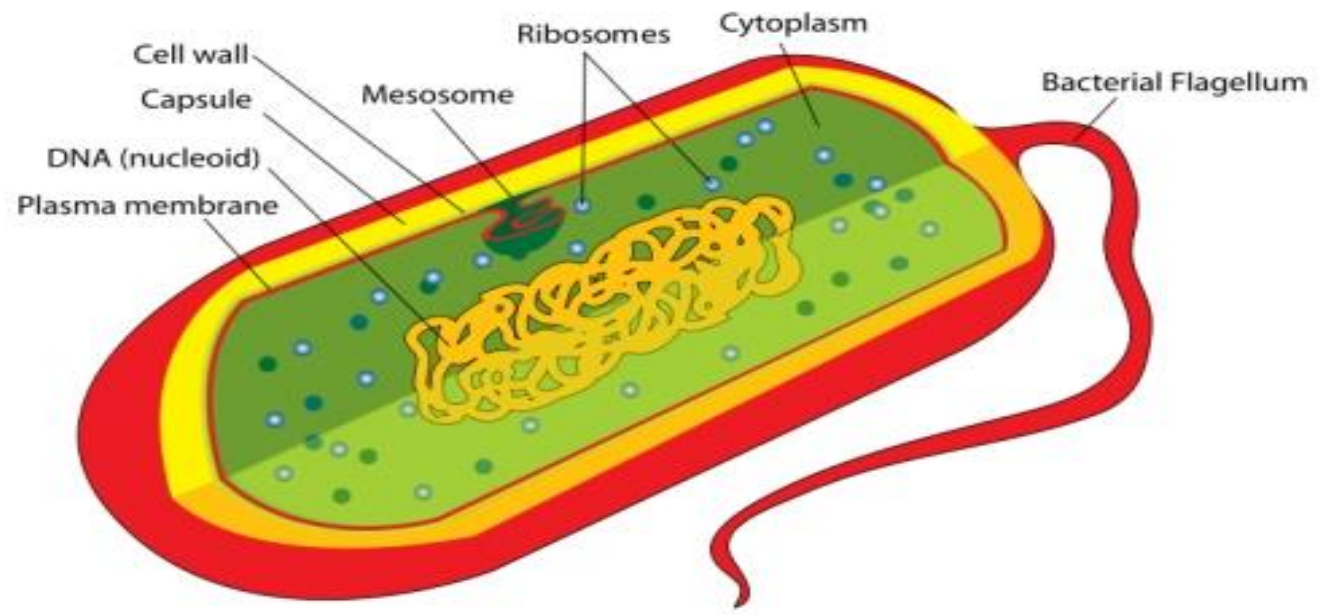
1. Spherical(गोलाकार)- spherical bacteria are called cocci.
2. Bacillus(छड़ाकार)- rod like bacteria
3. Spirilli(कुण्डलित)



Different forms of bacteria.



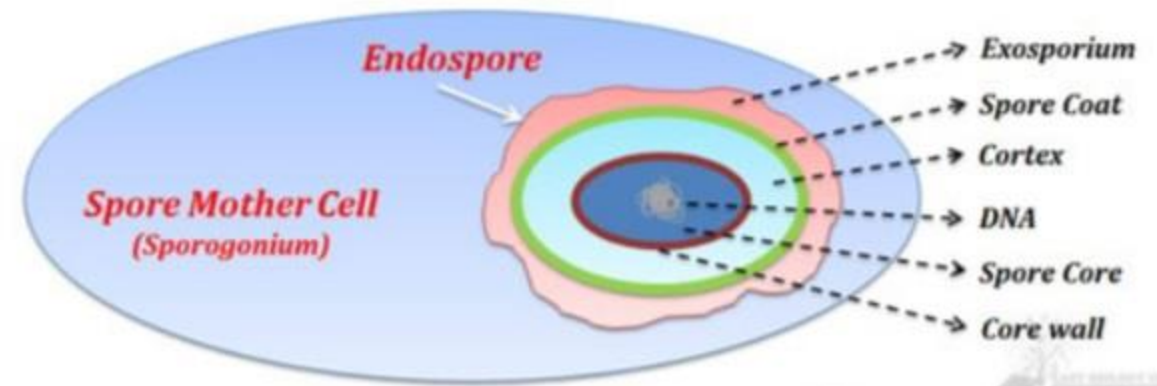
# Common features of bacteria




(बैक्टेरिया के सामान्य लक्षण)

- ▶ They lack membrane bound organelles such as true nucleus, mitochondria, chloroplast, golgi apparatus, endoplasmic reticulum etc. (इनमें कोशिकांग जैसे सत्य केंद्रक, माइटोकॉन्ड्रिया, क्लोरोप्लास्ट, गॉल्गी उपकरण, अन्तःप्रदव्य जालिका आदि का अभाव होता है।)
- ▶ Cell division by binary fission. (कोशिका विभाजन द्विखंडन विधि द्वारा होता है।)
- ▶ It's genetic material is DNA. (इसमें आनुवांशिक पदार्थ डी.एन.ए. होता है।)

► Some bacteria can form endospores.



Bacterial Endospore- Diagrammatic   
www.easybiologyclass.com

► Some bacteria have an extra circle of genetic material called a plasmid.



# Nutrition in bacteria

## जीवाणुओं में पोषण

### ► Autotrophic (स्वपोषी)

1. Photosynthetic bacteria (प्रकाश संश्लेषी जीवाणु) eg. *Chlorobium*
2. Chemosynthetic bacteria (रसायन संश्लेषी जीवाणु) eg. *Thiobacillus*, *Nitrosomonas*, *Nitrobacter* etc.

### ► Heterotrophic(परपोषी)

1. Parasites(परजीवी) eg. *Clostridium*
2. Saprophytes (मृतोपजीवी) eg. *Bacillus*
3. Symbiotic (सहजीवी) eg. *Rhizobium*

# Importance of bacteria

## जीवाणुओं का महत्व

### Field

- ▶ food and dairy
- ▶ Industries
- ▶ Medicine
- ▶ Biogeochemical cycles
- ▶ Sewage(waste water) treatment

### Examples

- ▶ *Lactobacillus, Pseudomonas, Salmonella*
- ▶ *Acetobacter aceti*
- ▶ *Bacillus*
- ▶ *Nitrosomonas, Nitrobacter*
- ▶ *Pseudomonas, Zooglea ramigera*

# Some disease causing bacteria बीमारी उत्पन्न करने वाले जीवाणु

## Disease (बीमारी)

- ▶ Meningitis
- ▶ Food poisoning
- ▶ Tetanus
- ▶ Diphtheriae
- ▶ Tuberculosis
- ▶ Plague
- ▶ Typhoid
- ▶ Cholera
- ▶ Syphilis

## Bacteria (जीवाणु)

- ▶ *Neisseria meningitidis*
- ▶ *Clostridium botulinum*
- ▶ *Clostridium tetani*
- ▶ *Corynebacterium diphtheriae*
- ▶ *Mycobacterium tuberculosis*
- ▶ *Yersinia pestis*
- ▶ *Salmonella typhi*
- ▶ *Vibrio cholera*
- ▶ *Treponema palladium*

# References

- ▶ **A textbook of microbiology by R.C.Dubey and D.K. Maheshwari**
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- ▶ **[www.sciencehistory.org](http://www.sciencehistory.org)**
- ▶ **[www.researchgate.net](http://www.researchgate.net)**
- ▶ **[www.microbenotes.com](http://www.microbenotes.com)**

***Thank you***