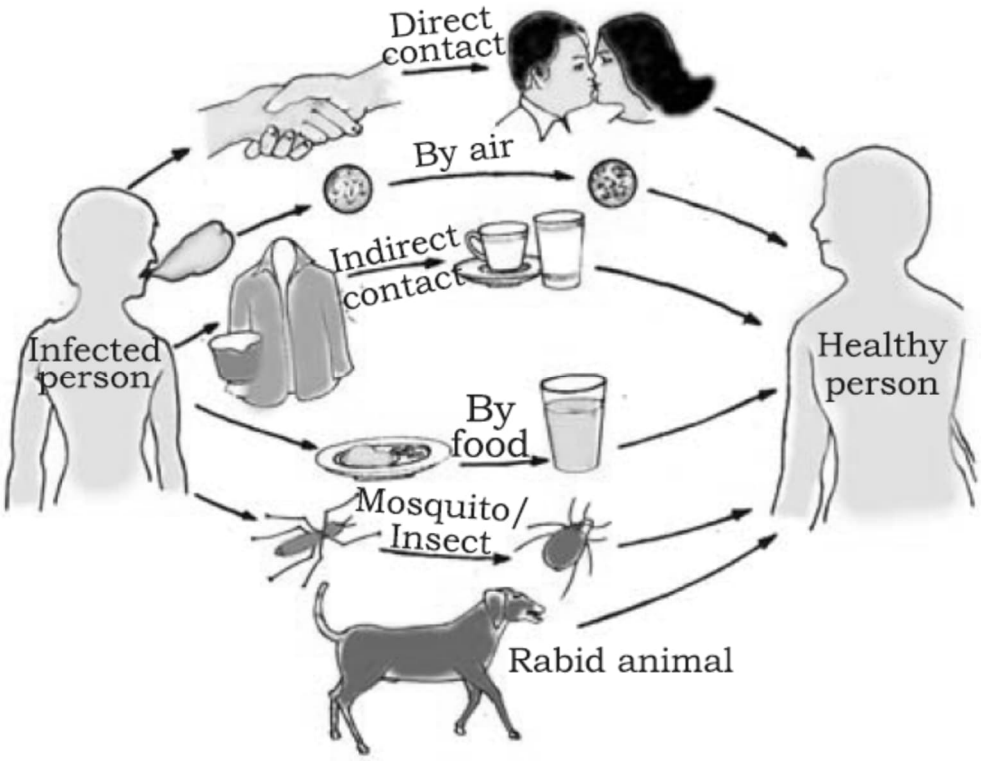
SCIENCE

DISEASES, BACTERIAL DISEASES, AND PROTOZOAN DISEASES

MODES OF TRANSMISSION OF DISEASES

Diseases can spread through the following means:

(i) **By air:** A number of disease causing microbes spread through air. The pathogens may reach the body through little droplets through out when an infected person sneezes or coughs. A healthy individual standing nearby can inhale these droplets, causing infection in that person.



Air borne diseases are more common in crowded areas as well as in poorly ventilated rooms.

Diseases spreading through air are: Common cold, Pneumonia, Tuberculosis. Diphtheria etc.

(ii) **By water and food:** Some diseases are transmitted when excretions from an infected person containing causal microorganisms get mixed with drinking water. Consumption of this contaminated water leads to the spread of diseases.
In addition, when food is prepared using this contaminated water, it can lead to food borne diseases. **Example :** Cholera, Typhoid, Hepatitis A, Jaundice, Diarrhoea etc.

(iii) **Direct physical contact:** Sexual act involves close contact between two people, which leads to the transfer of diseases such as syphilis, gonorrhoea, AIDS, etc. These diseases are known as sexually transmitted diseases. However, casual physical contact such as handshake, hugging, and kissing does not lead to the transfer of these diseases.
Example: AIDS, Syphilis, gonorrhea.

(iv) **Blood to blood contact:** This type of contact is established through blood transfusion or during pregnancy (between mother and baby) and through breast-feeding. **Example:** AIDS.

(v) **Animals or vector borne diseases:** Organisms which do not cause diseases themselves, but spread infection by transferring disease-causing microorganisms from an infected person to others are known as vectors. **Example :** Malaria.

- Mosquitoes are vectors of malaria. Malaria is caused by a protozoan Plasmodium. This protozoan is carried from an infected person to the healthy person by Female anopheles mosquitoes. The female anopheles mosquito requires highly nutritious blood to lay egg, so they feed on warm-blooded animals. The female mosquito that bites an infected person can transfer the disease-causing microorganism from an infected person's blood to a healthy person.

IMPORTANT TERMS

- **Vector :** A *vector* is an organism which harbours a pathogen and may pass it on to another person to cause a disease. *Example*, Mosquitoes harbour malarial parasite and transmits it to humans.
- **Carrier :** Carrier is an organism which itself does not harbour the pathogen but physically transmits it to another person. *Example*, Housefly is the carrier of cholera germs.

BACTERIAL DISEASES

1. **Tuberculosis:**

Pathogen: Mycobacterium tuberculosis. The bacterium releases a toxin called tuberculin.

Mode of transmission: Directly by sneezing, coughing or spitting or indirectly by air-borne discharged through sputum, cough and sneeze of infected person.

Symptoms:

(i) Persistent fever and cough

(ii) Chest pain and breathlessness

(iii) Sputum containing blood

(iv) Loss of weight and weakness.

Prevention and Cure:

(i) Isolation of TB patients to avoid spread of disease.

(ii) Use of handkerchief while coughing and sneezing

(iii) BCG (Bacillus Calmette Guerin) vaccine provides immunity.

(iv) Living rooms should be clean, neat and airy.

Do you know?

1. **TAB vaccination :** It contains killed typhoid bacilli and paratyphoid organisms – Salmonella paratyphi A and B.
2. **Widal test :** This test is a test to confirm the typhoid infection.
3. **DPT vaccination :** The vaccine is given to provide protection against – Diphtheria, pertussis (or whooping cough) and tetanus.
4. Sexually transmitted diseases (STD) are also called as venereal diseases (VD). Two major STDs are syphilis and gonorrhoea.
5. World T.B. day falls on 24th of March.

Do you know?

DOTS programme is for the treatment of tuberculosis (T.B.)

Directly observed treatment, short course (DOTS) chemotherapy.

DOTS is a strategy to ensure cure by providing the most effective medicine and confirming that it is taken. In DOTS during intensive phase of treatment, a health worker or other trained person watches as the patient swallows the drug in his presence. During continuation phase, the patient is

issued medicine for one week, of which the first dose is swallowed by the patient in the presence of health worker or trained person.

2. **Typhoid:**

Pathogen: Salmonella typhi bacteria.

Mode of transmission: Through contaminated food and water and house flies.

Symptoms:

(i) Continuous fever, headache, and slow pulse rate.

(ii) Reddish rashes appear on the upper abdomen.

(iii) Diarrhoea which becomes haemorrhagic (loss of blood)

Prevention and Cure:

(i) Proper sanitation and cleanliness should be maintained.

(ii) Proper disposal of excreta of the patient.

(iii) Antibiotics should be administered.

(iv) Disinfectant of water and proper cooking of food should be done.

(v) TAB-vaccine provides immunity for 3 years.

3. **Cholera**

Pathogen: Vibrio cholerae (comma shaped bacterium)

Mode of transmission: Through contaminated food and water. House fly is the carrier.

Symptoms:

(i) Acute diarrhoea

(ii) Muscular cramps

(iii) Loss of minerals through urine

(iv) Dehydration, which can lead to death of individual

Prevention and Cure:

(i) Cholera vaccination should be given.

(ii) Proper washing and cooking of food should be done.

(iii) Electrolytes (Na, K, sugar, etc.) dissolved in water should be given to the patient to check dehydration. In market it is available as ORS (Oral Rehydration solution).

(iv) Underground disposal of excreta.

(v) Proper covering of eatables to prevent contamination.

Do you know?

Bacteria and Antibiotics

Antibiotics like penicillin block the bacterial metabolic processes that build the cell wall. So, when the doctor prescribes antibiotics to treat any bacterial infection, bacteria are killed as they cannot secrete cell wall. However, since humans do not have cell walls, penicillin has no such effect on human body. Further, antibiotics would not work against viral infection, again because viruses do not have these pathways or cell wall.

Do you know?

1. The toxin produced by tetanus bacteria is called as tetanospasmin (tetanus toxin). This toxin is a neurotoxin which blocks the impulses that modulate muscle contraction.
2. The lock jaw symptom is also called as Trismus.
3. Fowls are resistant to anthrax.
4. Food poisoning by bacteria Salmonella is calles as Salmonellosis.
5. Food poisoning by bacteria Clostridium botulinun is called as botulism.
6. The toxin released by C.botulinum is called as botulin; this toxin is a potent neurotoxin and causes paralysis.
7. Antileprosy Day falls on 30th of January.

PROTOZOAN DISEASES

1. Malaria

Pathogen: Malarial parasite, Plasmodium

Mode of transmission: By bite of female Anopheles mosquito. Male Anopheles mosquito feed upon plant juices.

Symptoms:

(i) Headache, nausea and muscular pain

(ii) Feeling of chill and shivering followed by fever which becomes normal along with sweating after some time.

(iii) Patient becomes weak, exhausted and anaemic.

(iv) The malaria may secondarily cause enlargement of liver and spleen.

Prevention and Cure:

(i) Wire-gauzing of doors, windows etc to check the entry of mosquitoes.

(ii) Use of mosquito net and mosquito repellents.

(iii) Taking care of coolers, flower pots and uncovered water containers to prevent breeding of mosquitoes.

(iv) Sprinkling of kerosene oil in ditches or other open spaces where water gets collected.

(v) All the mosquito breeding places like ponds and ditches should be destroyed or covered.

(vi) Use of insect repellants to prevent mosquito bite.

Do you know?

(1) Malaria and Its Control

Biological control : In nature, animals eat and in turn are eaten by other animals. This is the food chain. The biological control includes using this information in getting rid of an animal which is causing harm to us, by introducing its predator ! Some larvivorous fishes like Gambusia, minnows and trouts are introduced in water bodies. These fishes feed on the larvae of mosquitoes and hence the mosquito population gets checked.

Chemical control : Earlier. DDT was used in the control of mosquitoes but it persisted in the environment for a much longer time. This resulted in the accumulation of DDT in the body of fishes, birds and humans through food chains. This is called as **Bio magnification**. Hence, insecticides such as BHC and Malathion are being used as a means of chemical control.

(2) Malaria and Female Anopheles Mosquito

It is only the female Anopheles mosquito that is a vector of malaria. They require proteinaceous food contents for egg production. Hence they suck the blood of vertebrate hosts. In case the host happens to be human, they may transfer the 'sporozoite' stage of Plasmodium, which causes malaria.

Macculoch (1827) proposed the name malaria. **Laveran** (1880) discovered the malarial parasite. **Sir Ronald Ross** (1887) confirmed that malaria is caused by malaria parasite and mosquito is the vector. He received **Nobel Prize** for medicine for this work.

Recently **Allan Porter** and his co-workers produced a genetically engineered aquatic bacteria at National Institute of Singapore. When mosquito larvae feed on these bacteria they are killed by the toxin produced by these bacteria. This can prove to be effective **biological control method**. Central Drug Research Institute (CDRI) Lucknow has developed an anti-cerebral malarial drug called – **Arteether**, which is extracted from a herbacous plant **Artemesia annua** belonging to family Asteraceae.

2. **Amoebiasis (Amoebic dysentery)**

Pathogen: Entamoeba histolytica

Mode of transmission: Through contaminated food and water.

Symptoms:

(i) Formation of ulcers in intestine.

(ii) Feeling of abdominal pain and nausea.

(iii) Acute diarrhea and mucus in stool.

Prevention and Cure:

(i) Proper sanitation should be maintained.

(ii) Vegetables and fruits should be properly washed before eating.

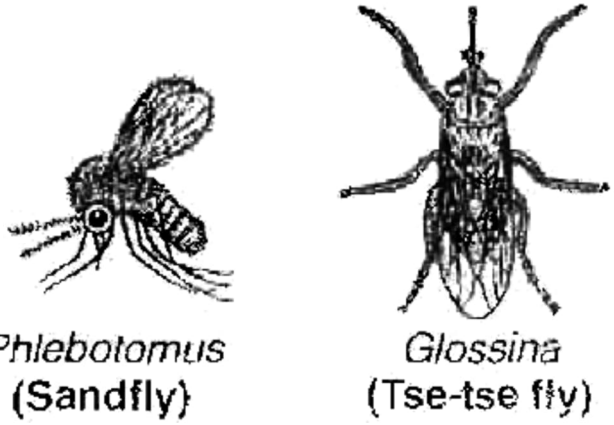
(iii) Antibiotics may be given to the patients.

Do you know?

Other Protozoan Diseases

1. **Balantidium dysentery :** It is caused by **Balantidium coli**, a ciliate protozoan. It causes diarrhoea but could eventually lead to severe dysentry.

2. **Trypanosomiasis :** It is caused by **Trypanosoma**, a flagellate protozoan. The disease caused is sleeping sickness. Vector of this disease is the tse-tse fly – **Glossina palpalis**.
3. **Leishmaniasis :** It is caused by **Leishmania**, a flagellate protozoan. The disease caused is kala azar. Vector of this disease is sand fly-Phlebotomus.



Do you know?

- **Primary host** is the host in which the sexual phase of the life cycle of a pathogen is completed and **secondary host** is the host in which the asexual phase of the life cycle of a pathogen is completed.
- **Carrier** is an organism which carries a pathogen from one organism to another but **vector** is an organism in which some stages of the pathogen's life cycle are also completed.