Pathogenic Bacteriology Introduction

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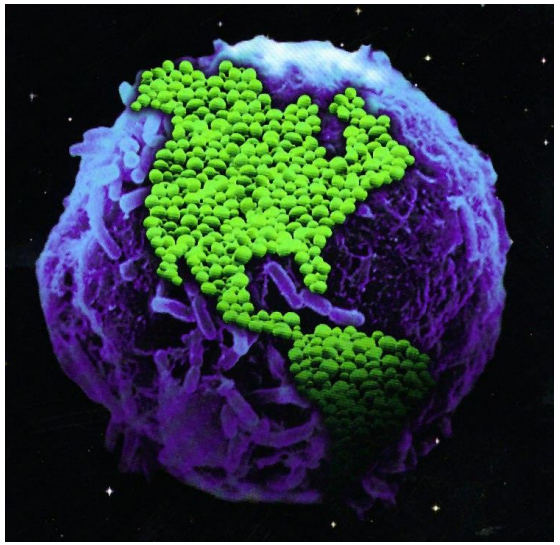
Infection:

The invasion of the host tissues by pathogenic microorganisms, their multiplication and production of harmful effects.



Pathogenic organisms:

The organisms which produce harmful effects or disease.

Non pathogenic organisms:

Free living organisms, deriving their nourishment from inert organic or inorganic materials. These organisms include the commensals and saprophytes

The commensals:

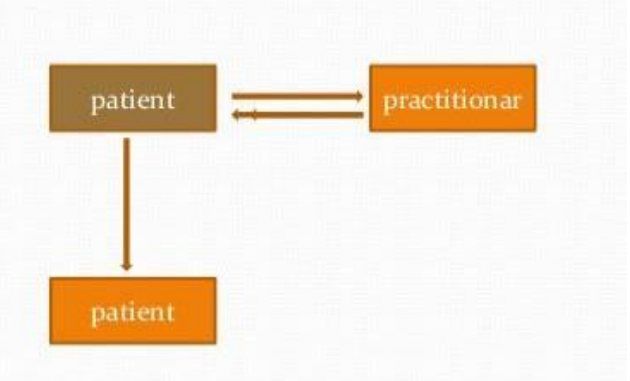
Are present as normal flora on skin and mucous membranes and derive nourishment from the secretion and waste products of the body without causing it any harm.

The saprophytes:

are those organisms which grow in the soil and live on dead organic matter.

Cross infection:

When the patient already suffering from a disease, a new infection is set up from another host or other external source.



Nosocomial infections: Cross infection occurring in hospitals.

Iatrogenic infections: infection after medical or surgical management whether or not the patient was hospitalized.

Pathogenicity:

The ability of microorganisms to cause disease or to result in the production of lesions, either in a natural way or experimentally in a given host species.

Invasiveness or aggressiveness:

The capacity of the organisms to multiply in the tissues of the host.

Toxicity:

The capacity of bacteria to damage the tissues.

Aggressiveness and toxicity are distinct.

Streptococcus pneumoniae is markedly aggressive, but little toxic.

Virulence:

Number of microorganisms or micrograms of toxin necessary to kill a given host when administered by a certain route. It is usually expressed as LD50.

LD50: (Lethal dose):

The number of organisms or micrograms of toxin which must be administered to kill 50% of the susceptible animals like the mouse and the guinea pigs.

Sources of infection for man

The sources may be exogenous or endogenous

1)Sources of exogenous infection

- 1- Patients
- 2- Infected animals
- 3- Soil
- 4- Carriers

2) Sources of endogenous infections

- 1- Convalescent carriers
- 2- Contact carriers
- 3- Paradoxical carriers
- 4- Chronic carriers
- 5- Healthy carriers

1- Patients

Infection transmitted from patient suffering from active disease to healthy individuals when they come in contact with the patient.

- **Example:**
  - **Pulmonary tuberculosis**
  - **Gonorrhoea**
  - **Syphilis**
  - **Influenza.**

2- Infected animals:

Such infections are called Zoonoses. Common infections acquired from animals include: Anthrax; Plague

Brucellosis; Salmonella food poisoning.

3- Soil:

Saprophytic microbes present in the soil, vegetation and similar habitats may cause human infections such as tetanus; gas gangrene.

4 - Carriers

Individuals harboring pathogenic organisms in their systems, but themselves not showing any clinical manifestation of the disease and are capable of disseminating the causative organisms to other.

Infectious diseases which are spread more frequently from carriers than from patients are:

Pneumococcus; Diphtheria; Typhoid fever; Bacillary dysentery.

Types of carrier:

1- Convalescent carriers:

They are persons in whom a limited localized infections continue for a variable period, weeks or months after clinical recovery from a disease.

Example:

After recovery from typhoid fever the organisms may localize in the gall bladder and discharged in the faeces.

2- Contact carriers:

Those persons who acquire the pathogens from a patient and carry them to infect other persons.

3- Paradoxical carriers:

Those individuals who acquire pathogenic organisms from another carrier .

4- Chronic carriers:

Those individuals who harbors pathogens for long period, a year or so and able to transmit the disease to others.

5- Healthy carriers:

Those individuals who harbors the pathogens but had never suffered from the disease caused by the pathogens.

2) sources of endogenous infections:

The source of endogenous infection is the site in the patients body where the organisms grow as harmless commensales.

Example:

Escherichia coli, a normal flora of human intestinal tract may cause acute suppurative infection in the urinary tract.

Mode of infection spread
The portal of organisms entry may be through:

1- Respiratory infections:

Infected secretions from nose, upper and lower respiratory tract are mainly disseminated into the environment in masses of infected secretions. Similarly secretions expelled in coughing, blowing the nose, sneezing are discharged in droplet spray.

Clothing, bedding, floors, furniture and other articles became contaminated with the secretions and may act as vehicles or reservoirs of infection.

Example: Tubercle bacilli; streptococcus; staphylococcus; diphtheria bacilli and small pox virus.

2- Digestive system infections:

Pathogenic microorganisms discharged in the feces of infected oral routes leading to their ingestion by the recipient.

A) water-borne infections:

Water supply may became contaminated with human excreta especially when the source of water supply is river or well, which used with out purification for drinking. Common diseases which spread through contaminated water are: typhoid fever; cholera; dysentery.

B) Hand infections:

A person may contaminate his hands with bacteria contained in traces of feces. Infection may be through contaminated baths , towels, door handles.

C) Food borne:

Infection may occur as a result of carry handling the food, by preparing or serving food. Food may also became contaminated by flies after feeding on exposed infected feces.

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3- Venereal infections:

These are the diseases which are transmitted almost exclusively by sexual contact. The causative organisms of some of the diseases are:

***Treponema pallidum* (syphilis)**

***Neisseria gonorrhoeae* (gonorrhea)**

in communities with low standard of living as in developing countries.

The spirochetes (*Treponema pallidum)* may be frequently spread by non-venereal means. Such as by the use of common drinking vessels, which carry the organisms from the mouth of an individual such as oral lesions to the mouth of others..

4- Skin wound and burn infections:

These superficial infections may be acquired by contact with infected hands, clothes or articles. Exposed wounds may some time became contaminated from infected dust particles especially in hospital infections.

5- Arthropod-borne blood infections:

In some diseases, blood sucking insects play important role in the spread of infection from one individual to another. The common arthropods and the diseases transmitted by them are:

Mosquito (malaria); filaria (yellow fever) ; flea (plague) ; tick for (rickettsia); louse (typhus, and relapsing fever); mite (scrub typhus); tsetse fly (trypanosomiasis).

6- Laboratory infections:

Laboratory workers may became accidentally infected while handling pathogenic organisms in the laboratory especially during injection of infected material or organisms in experimental animals such as in tuberculosis; brucellosis; plague; anthrax and serum hepatitis.

7- Congenital infection:

Some of the infective agents may pass through the placenta barrier, if the mother is infected during pregnancy. This is commonly observed in syphilis and rubella.

Epidemic disease:

A disease out break in a human population in which an increasing number of cases arise with time , usually due to an infectious agent commonly subside with in months or years at most.

Endemic disease:

The continuing prevalence of a disease in a population at a relatively low level.

Pandemic disease:

An epidemic of wide or nearly world wide extent.

Sporadic disease:

Intermittent presence of the disease during irregular periods in a small groups of population.

Morbidity rate:

The ratio of sick individuals to the total population of a community.

Mortality rate:

The death rate. (The ratio of dead individuals to the total sick individuals).

Toxins:

The principle cause of pathogenicity is the production of poisons called toxins.

Microbial toxins may be released into the surrounding fluid as exotoxins, or remain attached to the producing cell, are then called endotoxins.

General characters of Exotoxins and Endotoxins

property	Exotoxins	Endotoxins
1-organisms	Predominantly excreted by gram positive bacteria	Released by gram negative cell wall. Firmly bound with in the bacterial cell.
2-source	Excreted by living	Integral part of
	cells., found in high	microbial cell wall and
	concentration in fluid	liberated upon their
	medium.	disintegrated.
3-isolation	Readily separable from	Obtained only by cell
	cultures by filtration.	lysis, not isolated in
	Some isolated in purified crystalline state.	highly purified for.
4-chemical nature	Protein of high	Lipopolysaccharide-
	molecular weight	protein compound
	10000-900000 dalton	lipid-A probably responsible for toxicity
5-Antigen	Highly antigenic, stimulate the formation	Weakly antigenic, do not stimulate
	of high titer of antitoxin which	formation of antitoxin to polysaccharide
	neutralizes toxin, the	moiety .toxin not
	toxin easily converted to toxoid by formaldehyde	converted to toxoid.
6-lethal dose	Small dose, highly toxic.	Weakly toxic.
7-heat sensitivity	Easily inactivated by	Resistant, with stand
	heat over 60C	autoclave
8-action	Often enzymic	Non enzymic action
9-pyrexia	Usually do not produce fever in the host	Often produce fever in the host
10-tissue affinity	Specific tissue affinity	No specific tissue