

INFECTION CONTROL

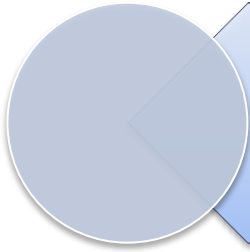
UNIT II

Microorganisms



Illustration: Don Smith

NUR 312 TEAM



Objectives

After completion of this session the students should be able to:

List sources of infection

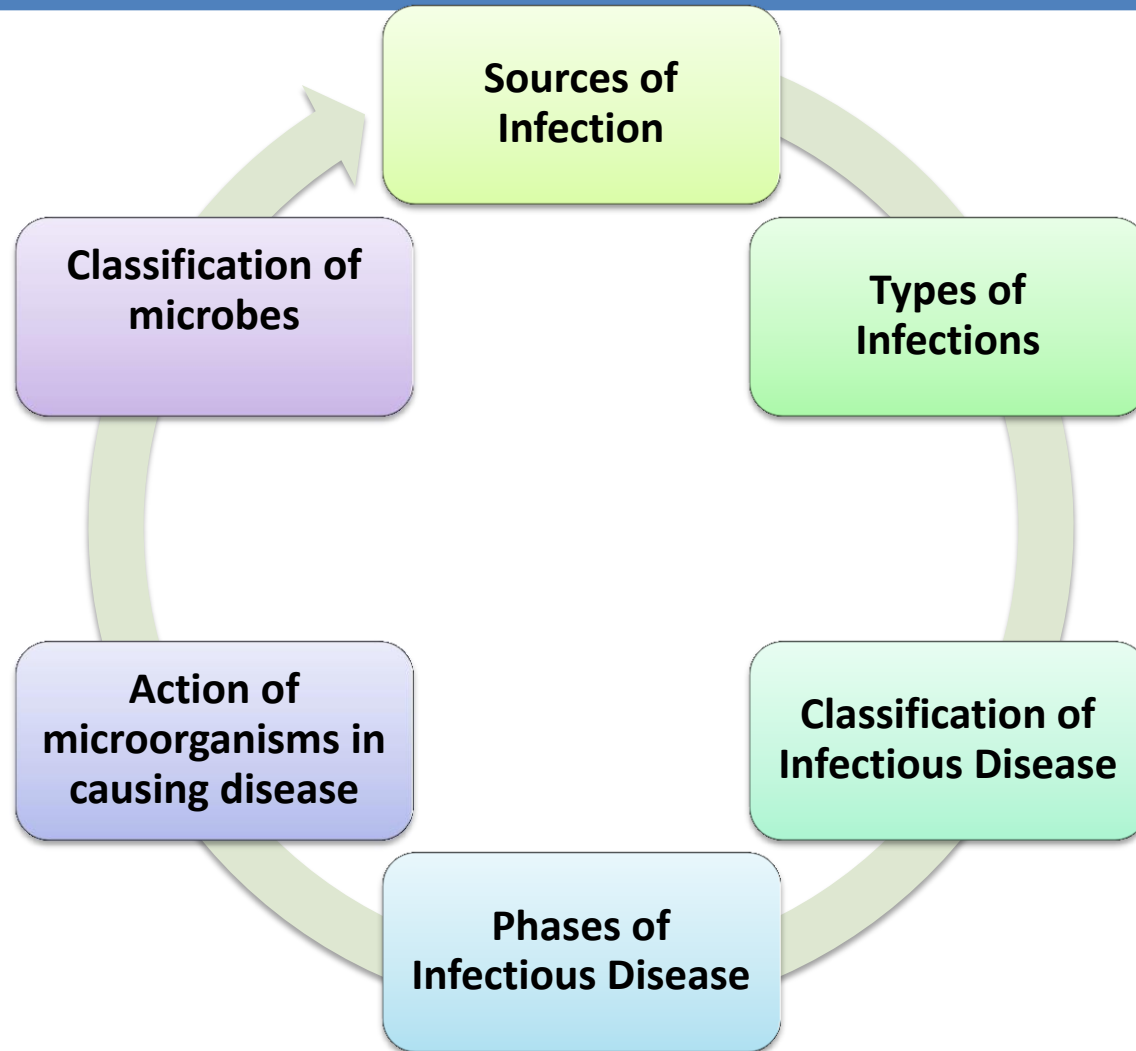
Discuss types of infection

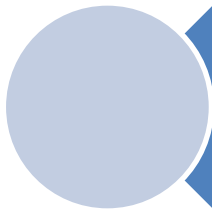
Mention classification of infectious disease

Differentiate characteristics of microorganism

Analyze action of microorganisms in causing disease

Outlines





Sources of Infection

Environment

- Land/soil
- Air
- Water
- Plants
- Contact with contaminated objects (furniture, medical equipment)

Humans

- As carriers
- Physical contact with infected persons
 - Skin to skin
 - Sneeze/cough
 - Cold/STI/Flu
 - Chicken pox

Animals

- As carriers
- Contact with contaminated animals
 - Animal bites
 - Rabies, malaria, bird flu, HIV, AIDS

Types of Infections:

Acute infection

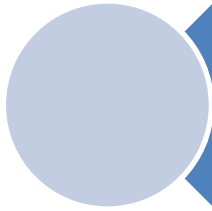
An infection of short duration that is often severe.

Chronic infection

An infection of long duration.

Latent infection

Persistent infection with recurrent symptoms that “come and go.”.



Classification of Infectious Disease

By duration

- **Acute** – develops and runs its course quickly.
- **Chronic** – develops more slowly and is usually less severe, but may persist for a long, indefinite period of time.
- **Latent** – characterized by periods of no symptoms between outbreaks of illness.

By location

- **Local** – confined to a specific area of the body.
- **Systemic** – a generalized illness that infects most of the body with pathogens distributed widely in tissues.

By timing

- **Primary** – initial infection in a previously healthy person.
- **Secondary** – infection that occurs in a person weakened by a primary infection.

Local infection

Only a specific portion of the body is infected

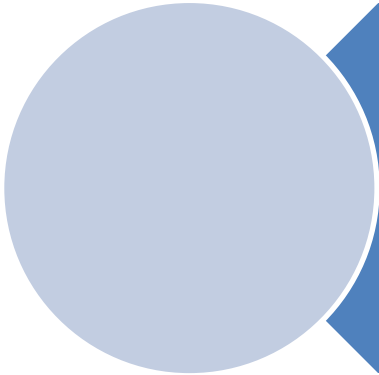
- pain
- redness
- heat at the site
- swelling
- pus
- foul smelling drainage

Systemic infection

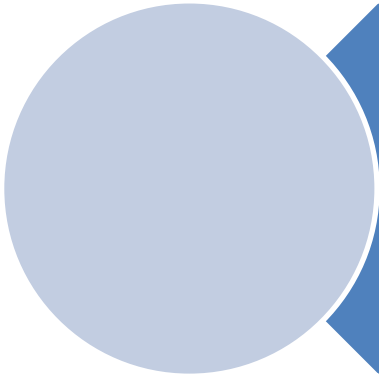
Affects the entire body

- fever
- aches
- chills
- nausea
- vomiting
- weakness

Phases of Infectious Disease

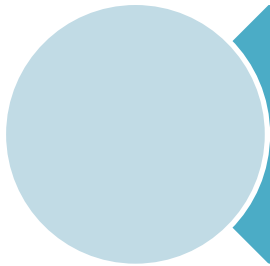


Incubation period –
time between infection
and the appearance of
signs and symptoms.

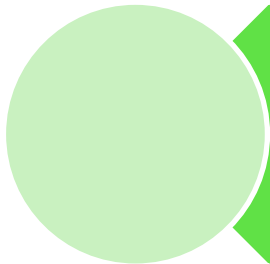


Prodromal phase – mild,
nonspecific symptoms
that signal onset of
some diseases.

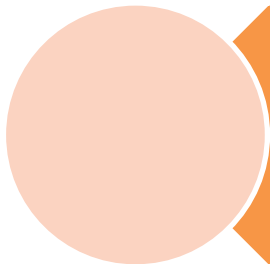
Cont.



Clinical phase – a person experiences typical signs and symptoms of disease.



Decline phase - subsidence of symptoms.



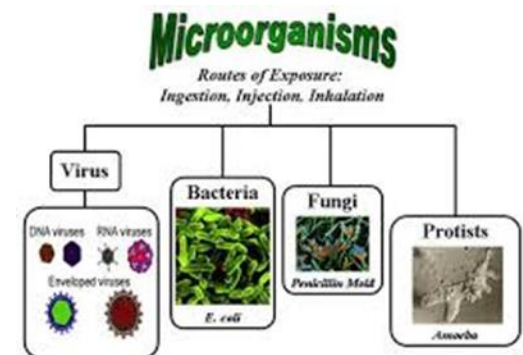
Recovery phase – symptoms have disappeared, tissues heal, and the body regains strength

Microorganisms:

Comes from Micro = small and organism = body

Cannot be seen with the naked eye, only under the microscope

- Are found everywhere, both inside and outside the body
 - in various body systems
 - within the body
 - found in the mouth
 - on our skin



Microorganisms(cont.)

Live in communities called colonies

Some microorganisms capable of causing disease – referred to as pathogens

Some microorganisms essential for maintaining health or have no harmful effect on the body – referred to as nonpathogens

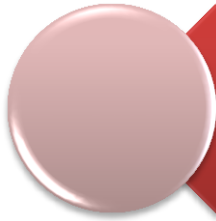
Colonies of nonpathogens in the body constitute what is known as normal body flora

Microorganisms(cont.)

Flora not the same in all body areas, e.g. normal flora in the intestines is different from the normal flora of the skin.

Nonpathogens misplaced to another part of the body can become pathogens; e.g. intestinal flora entering the urinary bladder can cause a urinary tract infection.

Infections that are acquired in the hospital are called nosocomial infections.



Characterization of microbes:

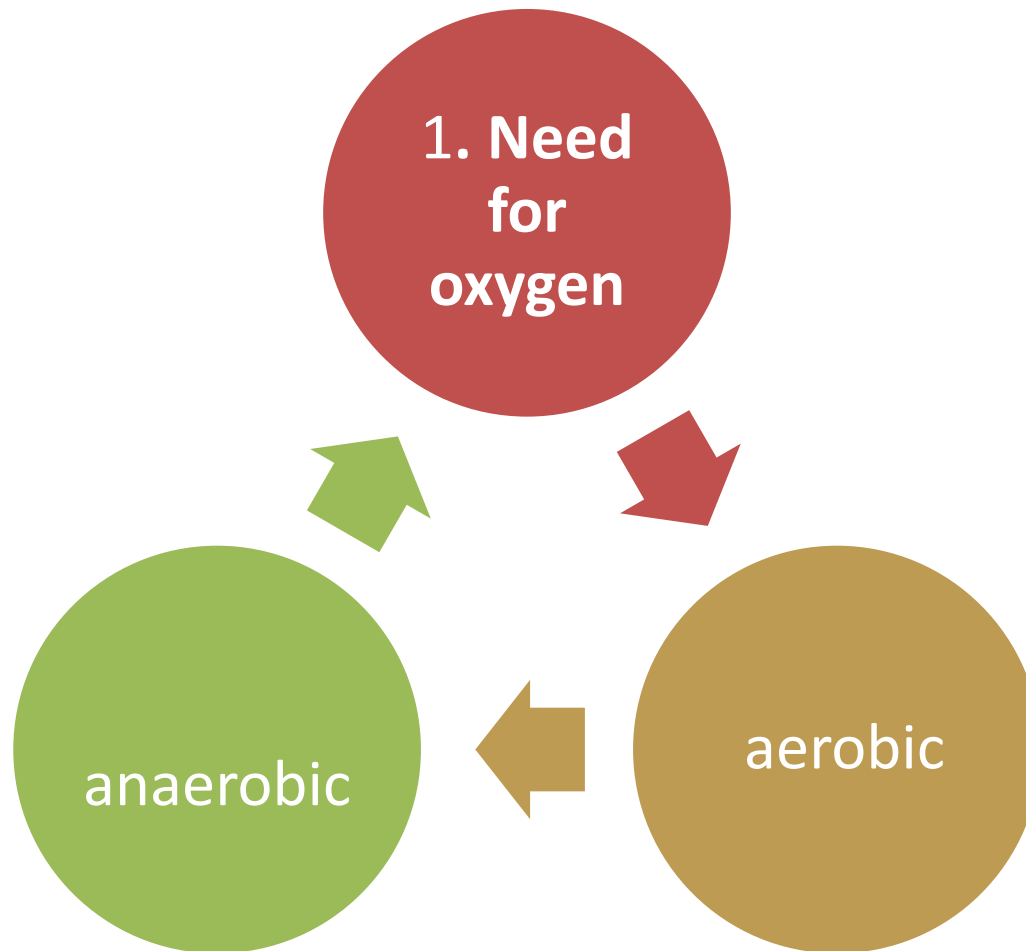
A. Shape and how they congregate (are arranged) together

1. Round, rod-shaped, spiral irregularly shaped.

2. Found in single units, clusters, chains

3. Can be single entity/cell capable of sustaining its own life, or made up of cell parts, i.e. DNA and requiring a host for existence.

B. Requirements for life



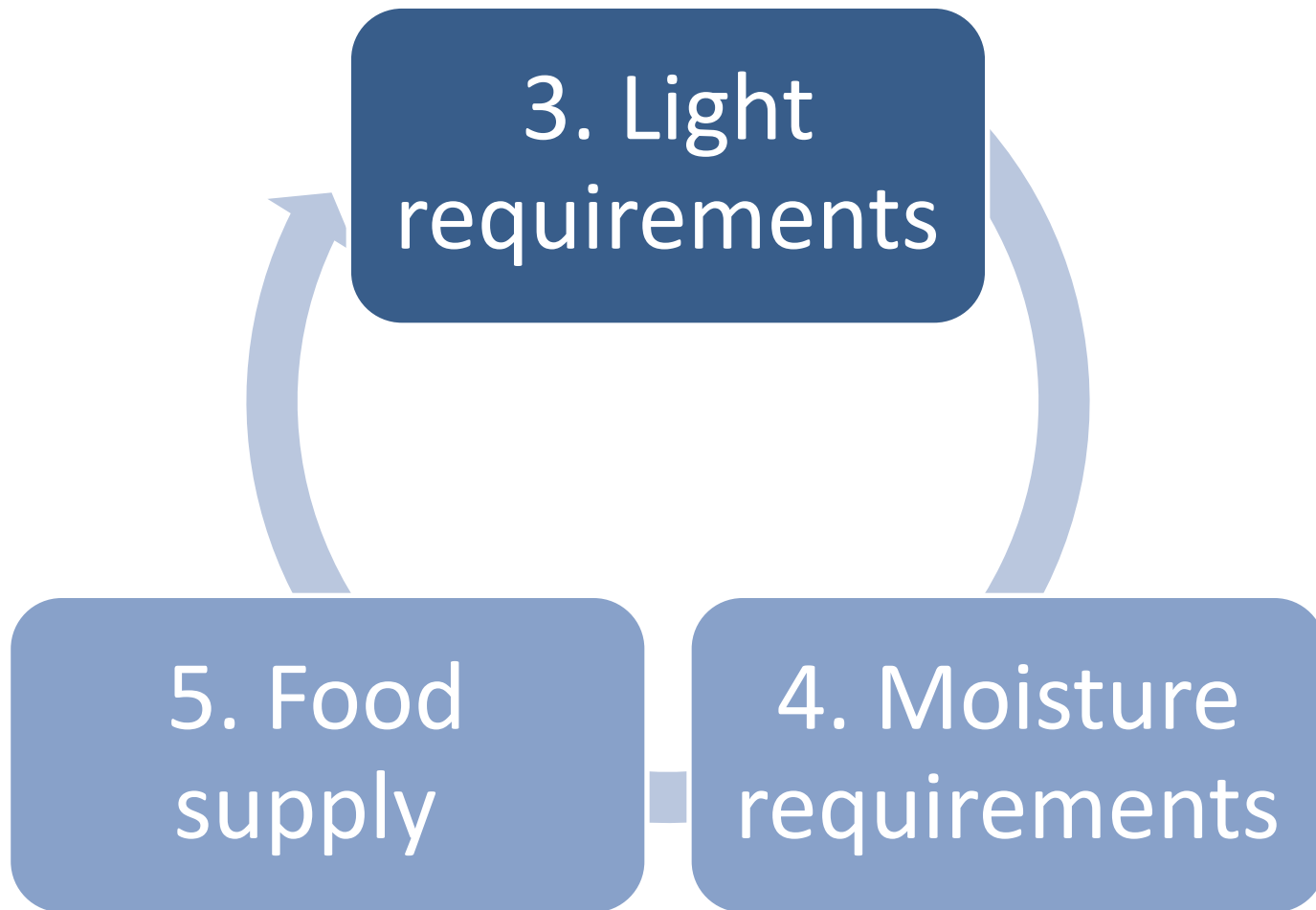
2. Temperature requirements

a. many pathogens grow best at body temperature

b. some microorganisms are killed by excess temperatures

c. some microorganisms are dormant at excess temperatures

Requirements for life(cont.)



Action of microorganisms in causing disease:

A. A pathogen meets its requirements for life within the human body.

B. Depending on the organisms, it meets its own needs and also causes disease by

Entering human cells and using them to reproduce.

1- Ultimately this attack destroys the human cell, but allows the proliferation of the microorganism

2- Example of this is the AIDS virus entering the lymphocytes

Action of microorganisms in causing disease

**C. Producing substances that are poisonous to the body
Poisons called toxins.**

D. Entering the body as a foreign entity, reproducing and causing disease or response (inflammatory) within the body

1. The body provides the requirements for proliferation.

2. Does not necessarily require the human cell for existence.

Classification of microbes



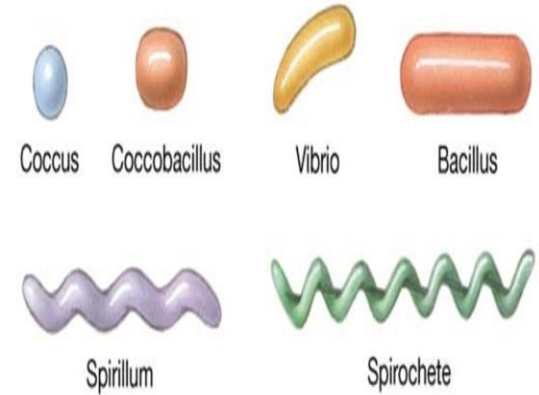
Bacteria

Single celled organisms that are prokaryotic

Reproduce rapidly

Produce toxins which damage body tissues

1. Named according to shape



c. Spirillum
(spirilla, plural)
– spiral shaped

a. Coccus
(cocci, plural) –
circular

b. Bacillus
(bacilli, plural)
– rod-shaped

2. Also named according to arrangement

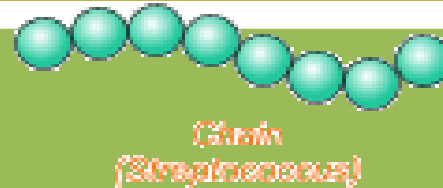
a. diplo – two



b. strepto – chains



c. staphylo – clusters



3. Example: streptococcus hemolyticus – circular chains that cause sore throats

Example: staphylococcus aureus – circular clusters which cause wound infections, boils, and toxic shock.

4. In lab tests some bacteria stain pink in test called gram stain – referred to as gram negative. Some stain blue in gram stain – referred to as gram positive.

5. Some diseases caused by bacteria as pneumonias, sore throats, Tuberculosis

6. Treated with antibiotics

Symptoms of bacterial infection

Fever, pain, swelling, vomiting, diarrhea, formation of pus, abortion •

Detection

Culture of body fluids to grow and identify the bacterial pathogen •

Treatment

Antibiotics, •

Adapt quickly and may become resistant to antibiotics •

Protozoa



Protozoa are unicellular microbes that can be parasites or predators of other microbes. Many are motile.

Most need a moist environment to live and many are transmitted through water.

Infections of small numbers of protozoa are common, they are seen quite often on microscopic fecal examinations with the animal showing no evidence of diseases.

Considered to be animals

Common diseases caused by protozoa are amoebic dysentery, malaria

Symptoms vary considerably depending on the protozoa involved but often include intestinal disorders such as diarrhea, weight loss, and anorexia.

Some protozoa cause fever, flu-like symptoms, or anemia.

Diagnosis is conducted through examination of blood, feces, or urine for the presence of the microscopic organisms. ELISA and PCR tests can also be done.

Fungus

A single or multi-cellular microbe that can infect various tissues.

Symptoms can include skin lesions, hair loss and respiratory or digestive system disorders.

Many antifungal drugs are available and can be used systemically as well as orally

Two groups of fungi associated with infections in humans

a. Yeast – diseases are thrush, monilial vaginitis

b. Mold – ring worm, athlete's foot

Diagnosis of fungal infections

- examination of skin lesions
- fungal culture
- Biopsies
- skin immunologic tests
- blood tests.

Treatment of skin lesions

- combination of anti-fungal drugs
- topical medications

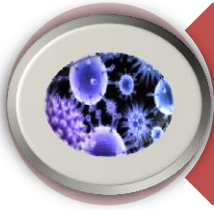
Systemic fungal diseases can be serious and result in severe tissue damage.



D. Rickettsiae

1. Microorganisms that like a virus require the human cell to live and proliferate.

2. Diseases caused by Rickettsiae are Rocky Mountain spotted fever and Lyme's disease



E. Viruses

A virus consists of a piece of genetic material (RNA) housed within a protective coat.

Viruses are not cells.

The virus reproduces by hijacking the cell of another organism (host) and getting the host cell to reproduce more viruses.

Most viruses cause disease and are specific as to which type of cell they will attack

Diseases caused by viruses include chickenpox, measles, German measles, influenza, shingles, AIDS, etc.

Viral Diversity



**Vaccinia virus
(cowpox)**



**Herpes simplex
virus**



**Rhinovirus
(common
cold)**



**Influenza
virus**



**HIV-1
(AIDS)**



**Adenovirus
(respiratory
virus)**



T4 bacteriophage



**Tobacco mosaic
virus (TMV)**



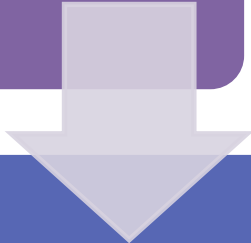
**Poliovirus
(polio)**



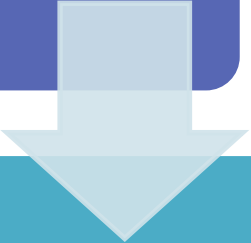
Ebola virus

100 nm

Symptoms of viral diseases are varied and related to the types of tissues that are infected.



Viral diseases are commonly associated with infections of the skin, blood, liver, uterus, fetus, brain, lungs, stomach, and intestines.



Diagnosis is done by virus isolation, ELISA* and PCR* testing. A decrease in lymphocytes on a CBC can also indicate a viral infection.



Treatments are mainly supportive in nature. This can include:

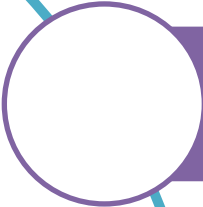
Administering fever reducers and rest.

Antiviral medications are being developed, but many are cost prohibitive.

Antibiotics kill bacteria and have no effect on viruses.



F. Prions



A prion is an infectious particle (not a cell) made from an abnormally folded protein found on the surfaces of nerve cells.



Prions are highly resistant to heat, radiation, and disinfectants.



The best known prion forms holes in brain tissue, making the brain look like Swiss cheese.



The prion causes mad-cow disease and may cause some forms of Alzheimer's Disease.



healthy
brain



advanced
alzheimer's



G. Helminthes

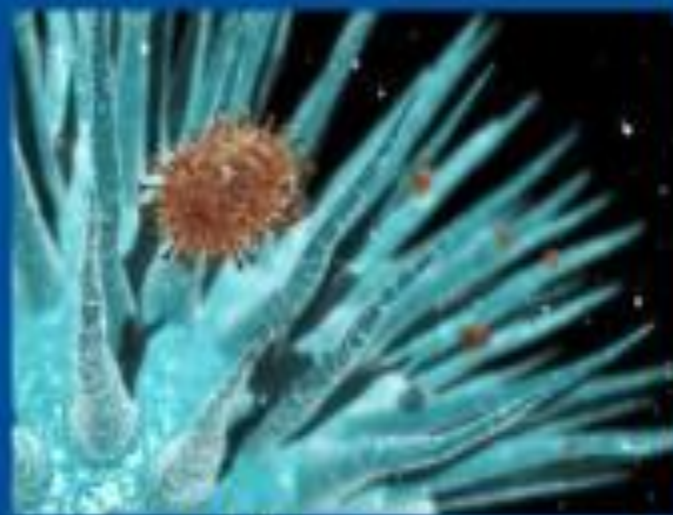


1. Worms i.e. pinworms, flatworms, roundworms

2. Treated with specific anti-helminthes agents



Bacteria



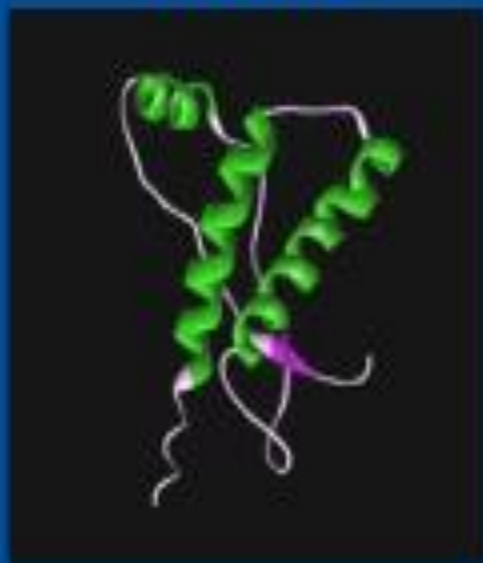
Viruses

Protozoa

Fungi



Prions





Risk of Infection

Risk of infection from blood borne diseases varies according to the type of exposure.

The following list was published by the (CDC) to help evaluate risk levels.

Risk decreases from top to bottom.

Contaminated needle stick injury (large-bore, hollow needle carries more risk than small bore solid needle).

Cuts with sharp objects covered with blood/body fluid.

Blood/Body fluid contact with an open area of the skin.

Blood/Body fluid contact to the mucous membrane surface of the eyes, nose, or mouth.

Blood/Body fluid contact to intact skin.

QUESTIONS/COMMENTS

