D. Selvatharasi
XII - A

BIO –ZOOLOGY

CHAPTER – II

MICROBIOLOGY

3 X 1 = 3

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11 Marks

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Chapter – 2 MICROBIOLOGY

I. Introduction

a) Microorganisms: Bacteria, Viruses, Fungi and Protozoan parasites.
b) Microbiology deals with the form, structure, reproduction, physiology, metabolism and classification of microorganisms.
c) Microbiological studies include
i) Distribution ii) Their relationship iii) Their effects on plants, animals and human beings iv) Their role in the substainability v) and also their beneficial aspects to biotechnology.

II. History of Medical Microbiology

i) Origin: ⇨ 1888 ⇨ Pasteur Institute in Paris was established
ii) **Robert Koch** ⇨ Director of the Institute for Infective diseases
iii) Medical microbiology deals with the aspects of Infection, the causative agents of infection and the diseases due to infection.
iv) Establishment of **Germ Theory of Diseases by Pasteur.**
v) **Medical microbiology involoves**
   a) Study of microorganisms that infect human beings.
   b) The mechanism by which they cause diseases.
   c) The body's response to infection and
   d) Specific antimicrobial prevention and treatment

III. LOUIS PASTEUR (France) (1822 – 1895)

i) The contribution of Pasteur leads to greater understanding of human aliments and animal diseases.
ii) Pasteur's work ⟶ The growth of bacteria and yeasts in **liquid culture.**
iii) Pasteur's developed methods of **sterilization** and of **Pasteurization.**
iv) Pasteur (1857) observed **yeast cells** within alcohol fermentation and ***Lacto bacilli*** **bacteria** with lactic acid fermentation.
v) **Findings**: "Specific microbes may cause Specific disease in man".
vi) Pasteur developed **vaccines,** for the control of **cholera, Anthrax** and **Rabies** in man.

IV. ROBERT KOCH (Younger contemporary of Pasteur) (1843 -1910)

i) **Contributions** : New procedure for staining, visualizing and growing bacteria,
ii) Koch **Solidified** liquid culture media with **Agar**
iii) He isolated and characterized the bacilli of Anthrax and tuberculosis and demonstrated their causative role.
iv) The impact of Koch work lead to the causative bacteria for diphtheria and tetanus and antibodies produced in host animals against the toxins. (discovery of specific toxins)
v) His findings also lead to **immunization therapy.**
vi) Awarded Noble Prize in 1905 for his work on tuberculosis.

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V. Joseph Lister : (1827 -1912)

i) He developed the technique o "Pure culture" of bacteria.
ii) **Pure culture: The growth of a mass of cells of the same species in a laboratory vessel / test tube using serial dilutions in the liquid media.**
iii) Lister obtained a pure culture of the organism **Bacterium lactis.**
iv) **Importance of pure culture:/ findings of Lister**
a) Suitable media for the growth b) Infections c) Fermentation d) Nitrogen fixation in soil etc.
v) Pure culture techniques lead to developments in modern microbiology.
vi) Joseph Lister in the year 1860 discovered a system for **"antiseptic surgery".** This system prevents the surgical wound infections and other lethal complications.

VIRUS
STRUCTURE, GENETICS, CULTURE AND DISEASES

I. INTRODUCTION :

a) Viruses are infectious agents,
b) Size: 20 – 300 nm (smaller than bacteria)
c) **OBLIGATE INTRACELLULAR PARASITES:**
Viruses can grow only in animal or plant cells, or in microorganisms.
Viruses are incapable of independent growth in artificial media.
d) Viruses Reproduce in these cells by **Replication**.
e) **Replication**: It is a process in which many copies or replicas of the viral component are assembled and made to represent the Progeny.
f) Metabolic activities like Protein synthesis, respiration (energy production) are all absent in Viruses
g) **BACTERIOPHAGES:**
i) Bacterial Viruses or Viruses infecting the bacteria are called bacterio phages.
ii) Some Viruses infect the bacteria multiply inside the bacterial body and causes the lysis of the host (LYTIC CYCLE)
iii) Some Viruses integrate themselves with the bacterial genome (LYSOGENY)

II. STRUCTURE OF VIRUSES:

a) Viruses are also known as Nucleocapsids.
b) Animal and plant Viruses composed of Nucleic acids surrounded by Protein envelop (capsid)
c) The Protein sub unit Present in the capsid are called capsomeres.
d) **Envelop**:
i) In some animal viruses, in addition to the nucleocapsid, an outer membrance like structure is present namely the envelop.
ii) The envelop is made up of lipoprotein.
iii) The symmetry of Viruses determined by the envelop.
iv) Virions with envelops are sensitive to lipid solvents like ether, chloro form.
v) Naked virions (without envelop) not affected by lipid solvents

SYMMETRY OF VIRUSES:-

i) Viruses exhibit a charactenstic symmetry. The envelop conceals the symmetry of Viruses.

ii) **Table:**

S.NO.	SHAPE	SYMMETRY TYPE	EXAMPLES
1	Spherical	Isohedral	Adeno Viruses, SV 15, Polio Viruses, (Their Surface is a lattice with identical triangular units)
2	Rod Shape	Helical	TMV, animal Viruses causing the diseases like measles, mumps and rabies.
3	Certain group	Complex (or) uncertain	Pox Viruses, T- bacteriophages.

iii) In Helical surface symmetry Viruses the nucleo capsid is a flexible structure packed within a fringed lipoprotein envelop. The fringes are made of glyco proteins.

iv) In TMV the nucleic acid core surrounded by closely packed capsomeres arranged in a helix.

Diagram refer New Book Page No: 119

III. VIRAL GENETICS

a) Viral genome is either DNA or RNA, but never both.

b) The genome contain all the genetic informations.

c) Nucleic acid content in a virion

i) 1% in influenza virus

ii) 50 % in certain phages

d) Number of genes. Dr. N.S

i) 3 to 4 genes – Para Viruses.

ii) Several hundred genes – Herpes, Pox Viruses.

e) **HAPLOID VIRUSES** : Virions with only a single copy of the nucleic acid

e.g) TMV, Bacterio phages.

f) **Diploid Viruses**: Virions with two copies of nucleic acid

e.g) Retro Viruses with two identical single stranded RNA'S.

g) The Virions are also known as infectious particles.

h) The Nucleic acid in the Virion may be either linear or circular.

i) Most animal viruses have linear DNA molecule.

j) In some plant viruses the genome is circular RNA.

k) But RNA in the animal Viruses is either double stranded or single stranded moleucle.

IV. CULTIVATION (OR) CULTURE OF ANIMAL VIRUSES

1. Viruses can grow only in **living cells.**
2. The most economical and conventient method, of cultivating a wide variety of Viruses is **"Chicken embryo technique"**
3. **"Chicken embryo technique"**
   a) Fertile chicken eggs are taken
   b) Incubated for 5 -12 days.
   c) Aseptically, Virus particles are inoculated through the shell.
   d) The opening of the shell is sealed with paraffin wax.
   e) The egg is incubated at 36° C – the ideal source for the growth of Viruses.
   f) The **Yolk sac** is a general **ideal medium** for the growth of viruses, where the Virus undergo replication.
4. **TYPES OF VIRAL CULTURES:**
   a) Primary culture
   b) Diploid cell strains
   c) continuous cell lines.

A) PRIMARY CULTURE:

i) These cultures are derived from normal tissue of an animal such as mouse, hamster, chicken, monkey and a human being.
ii) First the cells from these tissues are processed and cultured the first monolayer referred to as Primary Culture.
iii) **MONO LAYER:**
It is a confluent layer of cells convering the surface of culture vessel

B) DIPLOID CELL STRAIN:

i) It is derived by Primary cell cultures from a specific tissues like lung or kidney which is of embryonic in origin.
ii) Diploid Cells are the most employed **host of choice for the production of human vaccine virus.**

C) CONTINUOUS CELL LINES:

i) These cells are capable of an infinite number of doublings
ii) Continuous cell lines may arise with the mutation of a cell strain. OR It is commonly from the cell cultures from **malignant tissue**
iii) The Viruses which are very difficult or impossible to grow have been cultured in this method.

V. VIRAL DISEASES

A) CANCER AND VIRUSES:

i) Viruses are one of the causative agents for cancer or tumour.
ii) Tumour in during viruses are called oncogenic Viruses.
iii) **Oncogenic DNA Viruses:** Adeno virus, Polimo virus, simion virus (SV 40), A herpes Virus – Epstein – Barr Virus (EBV)
iv) Oncogenic RNA Virus : Rous sarcoma (RNA Sarcoma Virus)

B. RABIES VIRUS AND RABIES DISEASE

i) **Causal agent** : Rhabdo Viridae Virus / Rabies Virus belongs to Rhabdo Virus family.
ii) This virus is a parasite of domestic and wild animals
iii) **Mammalian animal sources** : Dogs, cats and bats.
iv) **Mode of transmission** :Bite of an infected animal.
v) **Incubation period** : About 3 to 8 weeks

vi) **Symptoms**
a) Severe head ache b) Hydro phobia
c) Muscular Spasms in throat and Chest d) High fever
e) Alternating excitement and depression.
f) If untreated the mortality rate is 100 %

vii) **Treatment:**
a) Rabies vaccine – inactivated prepared from the Virus propagated in cultures of diploid human cells.
b) This Vaccine is safe and highly immunogenic.

C. POX VIRUS :

i) Examples for pox viruses are small pox, chicken pox and Measles Viruses.
ii) **Characters of Pox Viruses**
a) Largest viruses b) Brick Shaped
c) It possesses double stranded DNA, protein and lipid.
d) The Nucleoid is dum bell shaped surrounded by two membrane layers.
iii) **SMALL POX VIRUS:**
a) **Variola Virus** is the causal agent of small pox disease.
b) It is a completely eradicated disease
c) This disease / Virus transmitted by droplet infection either directly or by handling articles infected by the patient.
d) Small pox vaccine consists of Vaccinia, closely related to Variola.
e) This vaccine gives Protection by humoral and cell mediated immunity.

D. HEPATITIS – B VIRUS

i) It is an example for enveloped Virus with a double stranded DNA.
ii) This Virus causes **Jaundice and hepatic carcinoma**
iii) Hepatitis – B disease is deadly and more infective than AIDS.
iv) **Treatment** : HBV Vaccine.
v) The vaccine composed of purified HBV Ag (Australian Antigen) obtained from the blood serum of healthy carriers.

BACTERIA

I. STRUCTURE :

a) Spherical b) rod c) spiral or d) comma shaped.
b) The structure, size and arrangement of bacterial cell constitute their morphology.

II. MORPHOLOGICAL FEATURES OF BACTERIA:

a) **Shape:** Spherical / rod / spiral / comma
b) **Arrangement of cells:** in pairs / clusters / chains / trichomes and filamentous.
c) The appendages flagella, pili are visible by special staining techniques or by electron microscopy.
d) For the identification of bacterial species the above mentioned morphological characteristics which are of taxonomic importance.

III. BACTERIAL CULTURE:

i) All bacteria need a nutrient medium for their growth and culture.
ii) **Bacteriological medium / synthetic medium**
a) It is a chemically defined medium
b) The culture medium possesses carbohydrates, Proteins, nucleic acids, lipids, vitamins and other complex organic substances.
c) Peptones, meat extract and yeast extract etc., are certain complex materials.
d) The culture medium supply the raw materials for the growth of a wide variety of heterotrophic bacteria.
e) Agar –agar used as a non-nutritive solidifying Agent.
f) **Types** : i) Simple solid – Nutrient agar
ii) Liquid media – Nutrient broth.

STEPS INVOLVED IN THE PREPARATION OF BACTERIOLOGIGAL MEDIUM

a) Each ingredient or the completely dehydrated medium is dissolved in the appropriate volume of distilled water.
b) pH of the medium should be determined.
c) Agar is added to the culture medium as solidifying agent. The medium is boiled to dissolve agar.
d) The medium is sterilized by auto claving.
e) Finally the medium is dispersed in flasks or tubes.

OTHER CONDITIONS FOR BACTERIAL CULTURE:

a) Physical conditions temperature b) Gaseous conditions c) pH d) Illumination
e) Hydrostatic pressure etc.,

BACTERIAL GENETICS

1. Bacterial cell have single circular strand of DNA (the genetic material)
2. Bacterial DNA is not associated with Proteins.
3. Bacterial genes possess the features of replication, phenotypic expression, mutation and genetic recombinations etc.,
4. Three types of gene transfer reported in Bacteria namely
a) **Conjugation** b) **transduction** and c) **transformation**

A. CONJUGATION:

a) Conjugation involves the transfer of some DNA (fertility factor) from one bacterial cell to another with the help of sex pilus or fimbriae.
b) It is followed by separation of the mating pair of cells.
c) In this method large segments of the chromosomes and in special cases the entire chromosome (DNA) may be transferred.

Diagram refer New book – Page No. 124, Fig.2.4.

B. TRANSFORMATION:

a) Bacterial transformation discovered by an English Health Officer, Griffith in 1928.
b) The transforming Principle was identified as DNA by Avery Macleod and Mc carthy in 1994.
c) Transformation is a process in which cell free or naked DNA containing the genetic information is transferred from one bacterial cell to another.

C. TRANSDUCTION :

a) In this method, a bacteriophage acts as a vector, transferring a portion of DNA from one bacterium (donar) to another (recipient).
b) **Types:** Generalized and specialized transduction.
c) **Generalized Transduction**: In this method all fregments of bacterial DNA have a chance to enter a transducing phage.
d) Specilized Transduction: In this method only a few restricted genes of the bacterial chromosomes are transduced.

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Bacterial Diseases

1. *Salmonella* and Human Diseases

A. *Salamonella* Causes

a) Enteric fever (Typhoid/para typhoid)
b) Gastroenteritis
c) Septicemia

B. Typhoid fever

a) ***Salmonella typhi*** Causal agent
b) Food and waterborne disease
c) Symptoms: Continued fever, Inflammation of intestine formation of intestinal ulcers Enlargement of spleen

C. Gastroenteritis

a) ***Salmonella choleraesuis*** Causal agent
b) Pathogen reach the blood stream from the intestinal tract where it multiplies.
c) **Symptoms**: High fever, chills,
d) When the bacterium infect the organs from blood then they cause Meningitis, Pneumonia, Absesses, Nephritis, Osteomyelitis / Endocarditic etc.

2. Cholera

a) Causing agent: ***Vibrio cholera***
b) Disease of **antiquity**
c) Water and food borne disease
d) Bacteria adhere the small intestine epithelium and produce **Enterotoxin**
e) **Symptoms** Vomiting, Produce diarrhoel stool (Rice Water, Stool) leads to severe dehydration, loss of minerals, Increased blood acidity.

3. Plague

a) Causing agent: ***Yersinia pestis***
b) Bubonic plague:
Symptoms: i) Enlarged and inflamed Lymph glands (Bubos)
ii) Chills, fever, nausea, vomiting and General weakness
iii) Untreated can cause 58% mortality.
c) **Pneumonic Plague / Pneumonia**
i) Thin watery sputum with red streaks of blood.
ii) Untreated can cause 100 % mortality.

4. Syphilis ⟶

a) Causal agent of the disease ***Tryponema pallidum***
b) Syphilis is a dreadful sexually transmitted disease.
c) **Mode of transmission**:
i) Direct sexual contact (venereal syphilis) or through placenta from an infected mother to foetus.
ii) Syphilis progresses in three stages namely primary, secondary and tertiary.
iii) Symptoms are severe in tertiary stage.
iv) **Symptoms**: Blindness, loss of hearing, Brain damage, Insomnia, headache, delusions, Spinal cord damage and Disfiguring **granulomatous** lesions. **(gummason)**

5. Gonorrhoea ⟶

a) Causal agent: ***Neisseria gonorrhoea***
b) Sexually transmitted disease
c) **Site of infection:**
Male – Urethra ; Female – cervix
d) **Symptoms:**
i) **Male :** Pain during urination.
ii) **Female :** Painful urination and vaginal discharge.
iii) **Other symptoms**: Fever abdominal – pain , arthritis, meningitis etc.,

PROTOZOAN MICROBIOLOGY

1. Eukaryotic single celled organisms, Microscopic in nature
2. Size : 5 – 250. Protozoan microbiology is mostly concerned with the disease aspects in human.
3. **Well know protozoan diseases:**
   a) Intestinal amoebiasis
   b) African sleeping sickness
   c) Malaria

4. **Other flagellated protozoans**
   a) Diarrhoea in children (*Giardia intestinalis*)
   b) Gingivitis in mouth (*Trichomonads)*

AMOEBIASIS:

1. Causing agent : ***Entamoeba histolytica*** protozoan endoparasite. (Sarcodina)
2. This disease prevalent in tropics and sub- tropics
3. **Vegetative trophozoite form is pathogenic**
4. The trophozoite make their way deep into submucosa(large – intestine) By eating through the intestinal mucosa.
5. Symptoms: Bloody stool (The blood with the ulcer contents)

Other pathogenic protozoans:

1. *Trypanasoma gambiens* – Causes African sleeping sickness
2. *Leishmania donovani* – Causes Kala azar
3. *Leishmania tropica* – Skin leishmaniasis.

MALARIA

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1. Causing agent : *Plasmodium*
2. Vector borne disease
3. **Life Cycle**: A sexual phase takes place in man **(Intermediate host)**
   Sexual phase takes place is female anopheles mosquito – **Definite host.**

Types of Malaria (on the basis of recurrence of fever)

1. Tertain / Benign tertian / Vivax Malaria – *Plasmodium vivax*
2. Quartan malaria – *P. malariae.*
3. Mild tertian / Ovale Malaria – *P. ovale*
4. Malignant tertian / perenicious malaria – *P. falciparum*
   Malignant type is fatal.

SYMPTOMS OF MALARIA

1. Malarial fever – shaking chills and sweating - chills subsides – Body temperature rise to 106^0 F – high due to toxic haemozoin granules.
2. Severe anaemia due to destruction of RBC's
3. Spleen enlargement (increase in number of phagocytes and Macrophages).
4. *Falciparum* infection causes thrombosis of visceral capillaries.
5. Death due to deposition of the parasites and malarial pigment in Brain capillaries.

6. Black water fever: (Falciparum infection)
a) Complete destruction of patient's RBC's (Erythrocytes)
b) Excretion of urine with haemoglobin
c) It is due to *P. falciparum* infection.

LARVAL MICROBIOLOGY

1. It deals with human diseases caused by parasitic larvae.
2. **Zoonotic infections / Zoonoses:**
Man acquires parasitic infections from animals. These infections are only accidental events. Parasite is not benefited, since the chain is usually broken with human infections.
3. **Types**:
a) Anthoroponoses: Infections with parasites that are maintained in man alone. E.g: Malaria and Filaria.
b) Zooanthroponoses: Infections in which man is not merely an incidental host but an essential link in the life cycle of the parasite. E.g: Beef and pork tapeworm.

In helminthic worms the trematodes represent a class which include unsegmented worms called Fluke.

PATHOGENECITY OF MICROORGANISMS

1. **Pathogenecity**: The ability of micro organisms to cause to disease in animals and humans.
2. Infectious disease due to the interactions between the disease producing pathogenic micro organisms and host organisms.
3. Pathogenecity of microbes due to several phenomena / Adaptations.
4. Types of Pathogenecity:
It differs in different strains of pathogenic species.
    a) **Virulent Strain** : Few Cells sufficient to produce / cause a disease
    b) **Less virulent** : Large number of cells may be needed to cause disease.
    c) **Avirulent**: Incapable of causing a disease, even large number of cells are inoculated into the host. Also known as attenuated strains. Widely used as a vaccines to elicit the immunity.

Adaptations seen in Microbes for Pathogenecity.

1. **Selectivity**: Pathogens are able to selectively attach to the **external surfaces** like SKIN conjunctiva/ **Internal surface** mucous membrances of the respiratory, gastrointestinal or urinogenetal tract.
2. **Penetration:** Pathogens penetrate the body surface and reach the internal tissues.
3. In some infections pathogens growing near its point of entry into the body.
4. Generalization: Some pathogens are widely distributed in different tissues or organs (generalized infection).
5. Some pathogens grow within the cells of host and affect/ disturb the normal physiological processes.

6. Some microbes may grow extracellularly, secrete toxic substance and bring damage to the body tissues.
7. **Virulent Strain**: 8. **Less Virulent**: 9. **A Virulent: / Attenuated strains:**

Antimicrobial Resistance

1. The number of **defence mechanism** by the **Host body** to mount **Resistance** against the **Invasion** and to prevent infection of pathogens is said to be **antimicrobial resistance.**
2. **Types of response of host / resistance**
   1. Natural or Non – Specific and 2. Specific
3. **Natural resistance:**
   It is of three types namely **species resistance, racial resistance and individual resistance.**

Chemotherapy

1. Definition: The control and treatment of infectious diseases with a chemical compound or drug is said to be **Chemotherapy.**
2. Chemotherapeutic agents:
   The chemical compounds and drugs. E.g: Pencillin , Streptomycin
3. **Characters of chemotherapeutic agents.**
   a) Destroys or prevents the activity of a disease causing pathogen without injuring the host tissues.
   b) It can penetrate the host calls and can encounter the pathogens in effective but safe concentrations / dosage.
   c) It leaves the host natural / immune mechanism unaffected.
   d) It exhibits selective toxicity towards micro organisms without having harmful effect / having least harm to the host.

Antibiotics and Chemotherapy

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1. Antibiotics: Antibiotics are special and unique type of chemotherapeutics agents obtained from living organisms such as bacteria / fungi.
   (or)
   A metabolic product of one micro organism that in very small amounts is detrimental / inhibitory to other micro organisms.
2. The first antibiotic **penicillin** was discovered by **Alexander Flemiming (1929)** from *Penicillium* species.
3. Types:
   a) **Broad spectrum antibiotics:**
      It can destroy or inhibit many different types of pathogens. E.g: Penicillin
   b) **Narrow spectrum**
      It can destroy specifically some or few species of pathogens. E.g: Tetracycline

4. Mode of action:
   a) **Bactericidal:** It destroys the microbial cells.
   b) **Bacteriostatic** : It inhibits the growth of bacteria.
   c) Bacteriostatic antibiotics may inhibit cell wall synthesis / destrupt the cell / wall damage the cytoplasmic membrane / inhibit protein synthesis and nucleic acid synthesis.

5. Types of antibiotics:
   a) **Antibacterial antibiotics:**
      Ampicillin, Streptomycin, Tetracyclin, Erythromycin.
   b) **Antifungal antibiotics:**
      Griseofulvin, Imidazole,
   c) **Antiviral antibiotics:**
      Amantidine, Cycloguanosine
   d) **Interferon:**
      Antiviral protein for treating viral diseases. It is a glycoprotein secreted by the leucocytes and fibrioblasts. It is the more promising chemotherapeutic agent for treating viral diseases.
   e) **Antitumour antibiotics**
      Anthramycin, Sibomycin, Tomaymycin and Neothramycin (**Anthromycin group**)

AIDS and its Control

1. The disease AIDS was identified in the year 1981.
2. Isolated by **Luc Montagnier (1983)** at Paster Institute, Paris and **Robert Gallo** at National Institute of Health (NIH), USA.
3. The term HIV coined by the committee on taxonomy of virus.
4. HIV belongs to the member of the **Lentivirinae** subfamily of human **Retroviruses.**
5. Retroviruses convert their RNA into DNA by **reverse transcriptrase** enzyme.

Structure of HIV

1. HIV is Spherical in shape Size 100 – 140 nm.
2. HIV consists of genetic material surrounded by protein envelop.
3. The protein envelop is attached several spicules of glycoprotein.
4. The attached to the gp41 on the inner side of the viral coat.
5. gp 41 is a long protein withover 100 aminoacids. GP 120 appears like a knob.
6. E.M.Structure of viral surface made of 12 pentagons and 20 hexagons. HIV also contains other proteins including some **HLA antigens.**
7. The genome of HIV contains two helix of RNA molecules in folded form. Reverse transcriptase is attached to RNA.

Diagram refer New book page – 131, fig 2.6

Pathogenesis

. HIV responsible for profound immunodepression in humans.
. Immunodeficiency in human being due to depletion of one of WBC, CD4 plus T-helper cells (lymphocytes)
. HIV also destroy B – lymphocytes and macrophages.
. The infected macrophages serve as a reservoir or viruses and disseminate to all tissues in the body.
. **Location of HIV:** Blood , semen, vaginal secretion, breast milk ,CSF, Synovial fluid peritoneal fluid, pericardial fluid and Ammniotic fluid.
. HIV can ever destroy the brain cells.

Diagram refer New book Page – 132, Fig 2.7

Symptoms of AIDS (Defined by WHO)

1. Weight loss- at least 10 % of body weight.
2. Chronic diarhhoea for more than a month.
3. Prolonged fever 4. Night sweats
5. Persistent coughs 6. Recurrent viral infections(Herpes Zoster)
7. Opportunistic infections such as tuberculosis and **Oropharyngeal candidiasis** (fungal infection in mouth and throat).
8. Meningitis and nerve damage 9. Loss of memory and intelligence.
10. **KAPOSIS SARCOMA**: An unusual cancer which produces scattered purplish lesions over the chest and abdomen.

Diagnosis of AIDS

1. **Elisa Test:**
   (Enzyme Linked Immuno sorbent Assay)
   It is a sensitive preliminary blood test used to detect HIV antibodies.
2. **Western Blot**
   It is the confirmatory test. This test is highly specific and based on specific antibodies to viral core proteins.

Control and Management of AIDS

I. Control:

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1. Blood and blood products should be screened.
2. Educate people about do's and don'ts in AIDS.
3. Create more awareness among the public.
4. Education about protected sexual behaviour and practices.
5. Participation of voluntary agencies, teachers, NGOs, Paramedical workers several other voluntary health organizations, in AIDS awareness programme.
6. **Antiretroviral drugs Such as AZTs (Azidothymidine / zidovudin) and saquinovir etc** made available to patients.

II. Management:

1. Treatment of opportunistic infections and cancer
2. Anti retroviral drugs treatment 3. Immunomodulators treatment
4. Supportive treatment 5. Counselling to the patients.