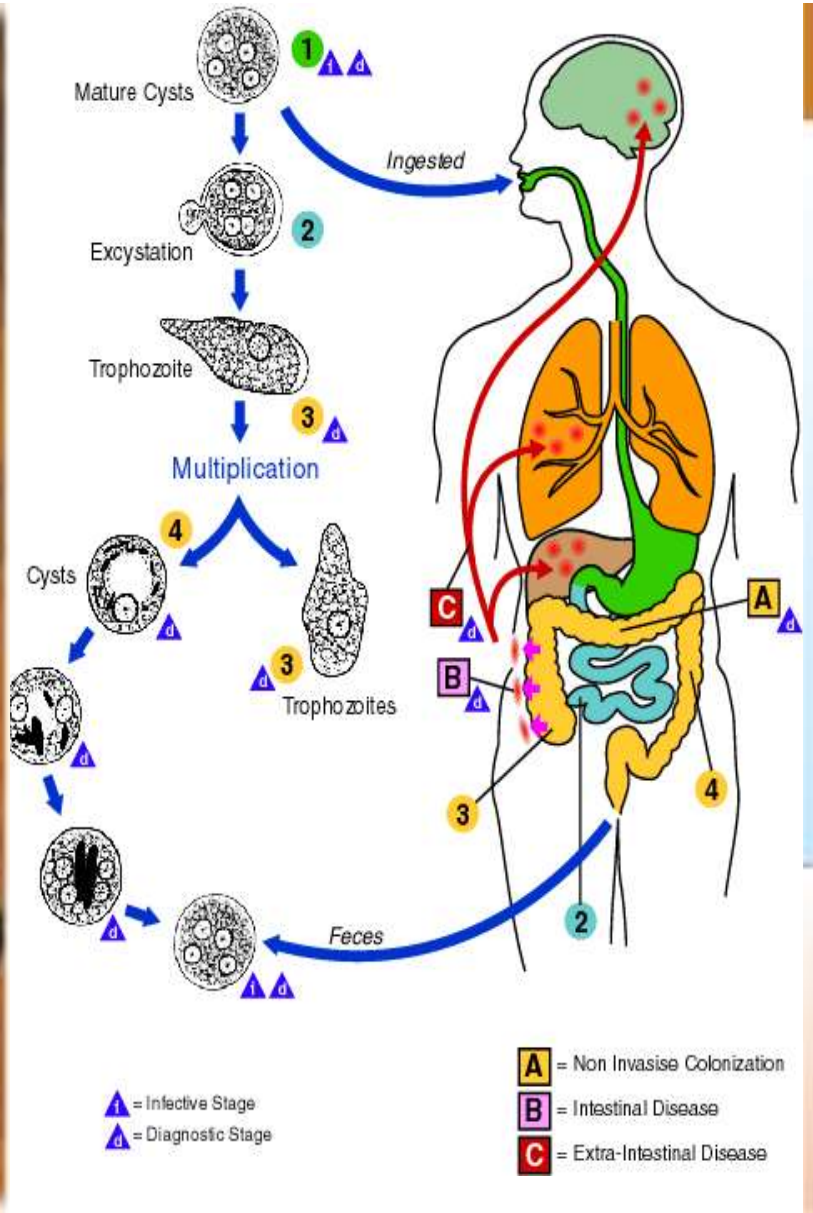
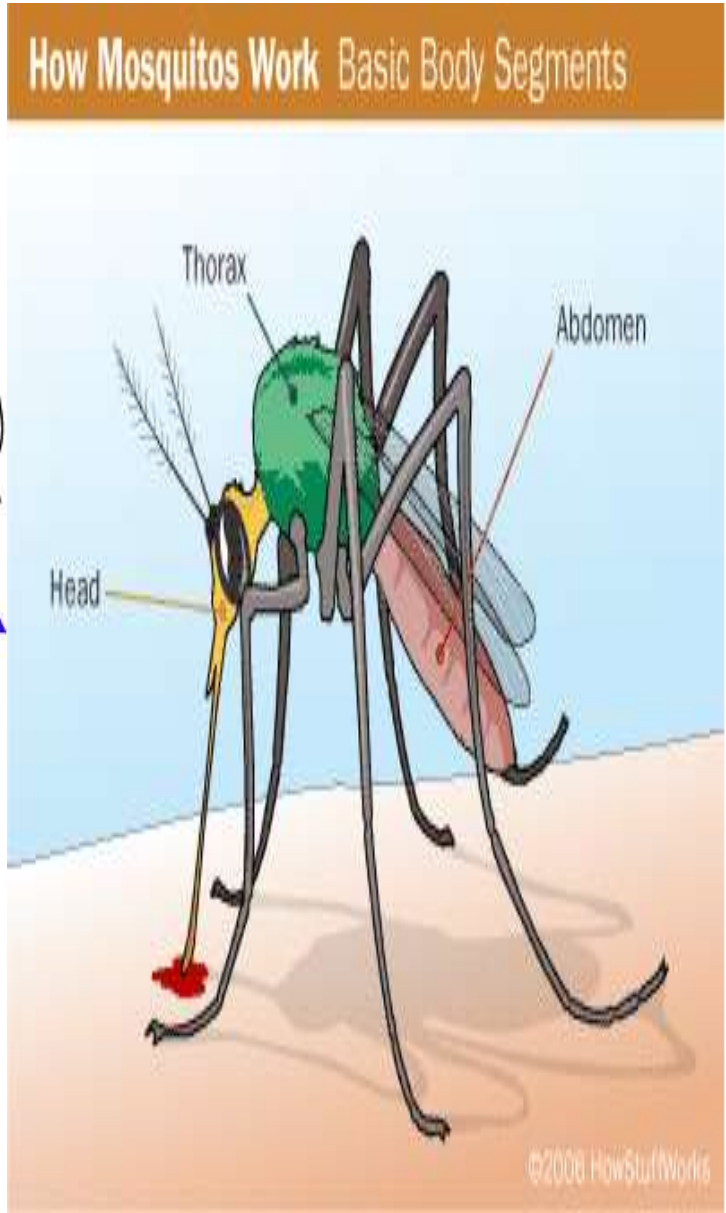
MEDICAL PARASITOLOGY





MEDICAL PARASITOLOGY

INTRODUCTION :

- The *parasites* which infect man
- The *disease* they produce
- The *response* generated by them
- Various methods of *diagnosis*
- *Prevention.*

PARASITE : *An organism that entirely dependent on another organism ie its host, for all or part of its life cycle and metabolic requirements.*

Microparasite & Macroparasite

- On basis of their location – *Ectoparasite & Endoparasite*

ECTOPARASITE – lice – causes infestation.

ENDOPARASITE – all protozoan & helminthic – cause infection.

OBLIGATE PARASITE :

- Cannot exist without a host eg. Toxoplasma gondii

FACULTATIVE PARASITE :

- Live either a parasitic or free-living existence eg. Naegleria fowleri, Acanthamoeba spp., B. mandrillaris

ACCIDENTAL PARASITE : Attack an unusual host eg. Echinococcus granulosus in man

HOST : Harbours the parasite and provides the nourishment and shelter

DEFINITIVE HOST : sexual reproduction

INTERMEDIATE HOST : larval or asexual stages

RESERVOIR HOST : Harbours the parasite and serve as imp. source of inf. to other hosts

VECTOR :

- Usually an insect, that transmits an infection from one host to another e.g. housefly

HOST-PARASITE RELATIONSHIP

SYMBIOSIS :

- An association, one cannot live without the help of the other

COMMENSALISM :

- Only parasite gets benefit without causing any injury to the host

PARASITISM :

- Parasite gets benefits from the host and host always suffers from some injury

SOURSES OF INFECTION

CONTAMINATED SOIL AND WATER :

- Eggs of A.lumbricoids, Trichuris trichiura
- Cysts of E.histolytica, Giardia lamblia etc.

RAW OR UNDERCOOKED PORK :

- T. solium, Trichinella spiralis

RAW OR UNDERCOOKED BEEF : T. saginata

BLOOD-SUCKING INSECTS : Plasmodium spp., Wuchereria bancrofti, Leishmania spp. etc.

HOUSEFLY : E. histolytica

DOG : Echinococcus granulosus

CAT : T. gondii

MAN : E.histolytica, Enterobius vermicularis and H. nana

AUTOINFECTION: E.vermicularis & S.stercoralis

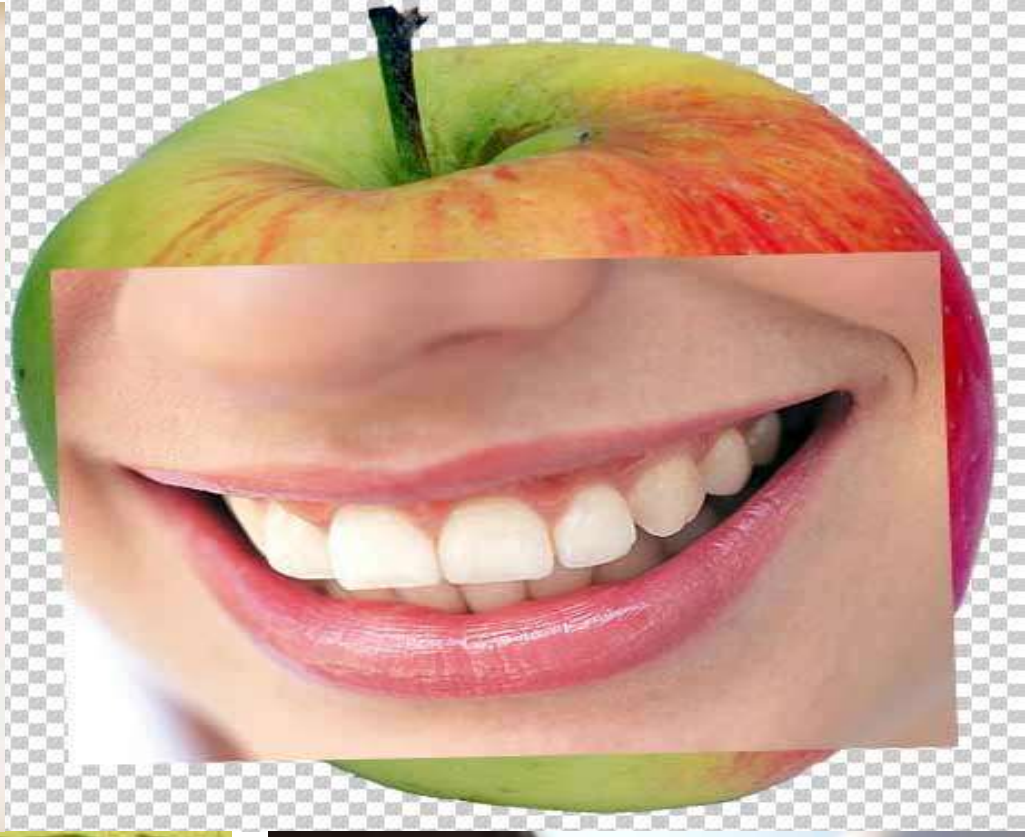
- Freshwater fishes , crab and crayfishes : Diphyllobothrium latum, Paragonimus westermani

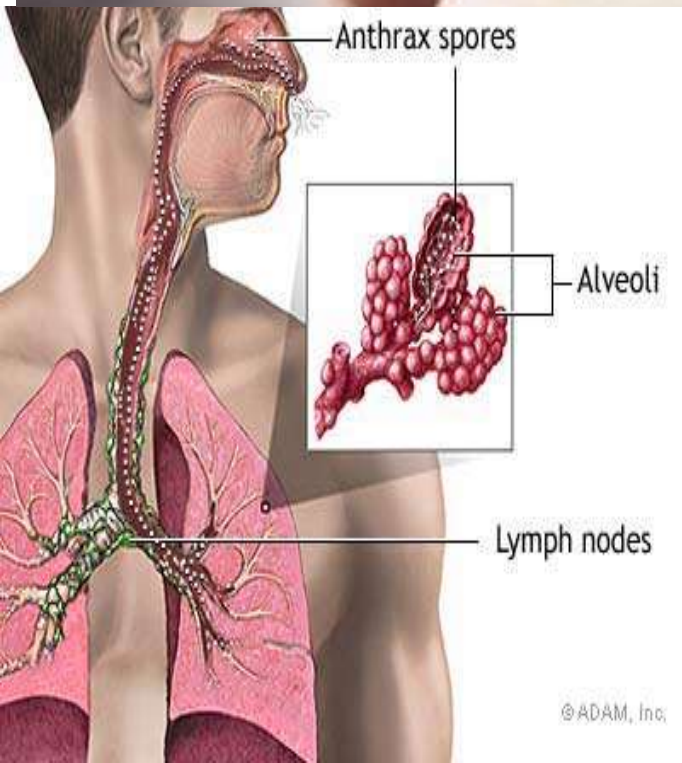
PORTAL OF ENTRY

MOUTH : E.histolytica, G.lamblia, B.coli, etc.

INHALATION : Eggs of E.vermicularis

SKIN : A.duodenale, S.stercoralis, Plasmodium spp., Leishmania spp., W.bancrofti etc.




Anthrax spores
Alveoli
Lymph nodes
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CONGENITAL : T.gondii, Plasmodium spp.

SEXUAL CONTACT : Trichomonas vaginalis etc.

IATROGENIC INFECTION : Malaria parasites may be transmitted by transfusion or by contaminated syringes and needles

The most common methods of transmission of HIV are:

Unprotected sex with an infected partner

Sharing needles with infected person

Almost eliminated as risk factors for HIV transmission are:

Transmission from infected mother to fetus

Infection from blood products

PATHOGENICITY

TRAUMATIC DAMAGE :

- By entry of filariform larvae of S.stercoralis etc.
- By attachment of Hookworms to the intestinal wall
- Eggs of S.haematobium and S.mansoni in urinary bladder and intestinal canal
- Large worms - A.lumbricoides and T.saginata may produce intestinal obstruction

LYTIC NECROSIS –

- E.histolytica secretes lytic enzymes which lysis tissues.
- Plasmodium spp., Leishmania spp. cause necrosis during their growth and multiplication

ALLERGIC MANIFESTATIONS :

- By secretions and excretions of the growing larvae and the products liberated from dead parasites.

INFLAMMATORY REACTION :

- Most of the parasites provoke cellular proliferation and infiltration at the site of their location.
- Cause eosinophilia
- Anaemia
- Black water fever in malaria
- Inflammation of L.I (E.histolytica)

NEOPLASIA :

- Schistosoma haematobium can cause vesical carcinoma.

SECONDARY INFECTION :

- The migrating larvae e.g. strongyloidiasis, ascariasis - may carry bacteria and viruses from intestine to the blood & tissue.

IMMUNITY IN PARASITIC INFECTIONS

- Less efficient than bacterial and viral infections
- **CMI –** Cytotoxic T (Tc) cells, Natural killer (NK) cells, Activated macrophages.
- **AMI –** Antibody (produced by B-cells) mainly IgM, IgG, IgE.

PRESERVATION OF STOOL SPECIMENS :

FORMALIN SOLUTION -

- 10% formalin saline – 3:1
- (+) cysts, eggs and larvae
- (-) permanent stained smear, trophozoite, PCR

POLYVINYL ALCOHOL (PVA) -

- Ethyl alcohol + $HgCl_2$ + GAA + Glycerine + PVA
- 3:1
- (+) cyst, trophozoites, trichrome staining
- (-) acid fast stain, safranine stain

MERTHIONATE-IODINE- FORMALIN (MIF) SOLUTION -

- Sol. 1 – thiomersal + formaldehyde + glycerol
- Sol. 2 – Lugol's iodine
- **Stains and fixes** cysts, eggs, larvae without any need for further staining by wet mount
- Well preserved for 1 year or more

SCHAUDINN'S SOLUTION -

- $HgCl_2$ + Ethyl alcohol + GAA + Glycerol
- 14:1
- It fixes and preserves the specimen for 1 year

LABORATORY DIAGNOSIS

DEMONSTRATION OF PARASITE :

IN STOOL :

- Wet mount : Normal saline and Lugol's iodine (trophozoites, cysts, eggs)
- By concentration methods : Salt flotation or formal-ether con. method
- By Ziehl-Neelsen staining e.g. Cryptosporidium parvum, Isospora belli.

EXAMINATION OF FAECES

COLLECTION OF SPECIMEN :

- Normally passed stool
- No Barium enema specimen
- Three faecal samples x 3 days
- First two samples – During normal bowel movement
- 3rd sample – After magnesium sulphate purge
- Amount – Whole stool, series of stool samples, milligram amount

EXAMINATION OF STOOL SPECIMENS -

- Liquid stool specimens – within 30 min
- Semiformed stool specimens – within 60 min
- Formed stool specimens – within 24 hrs

METHODS OF EXAMINATION

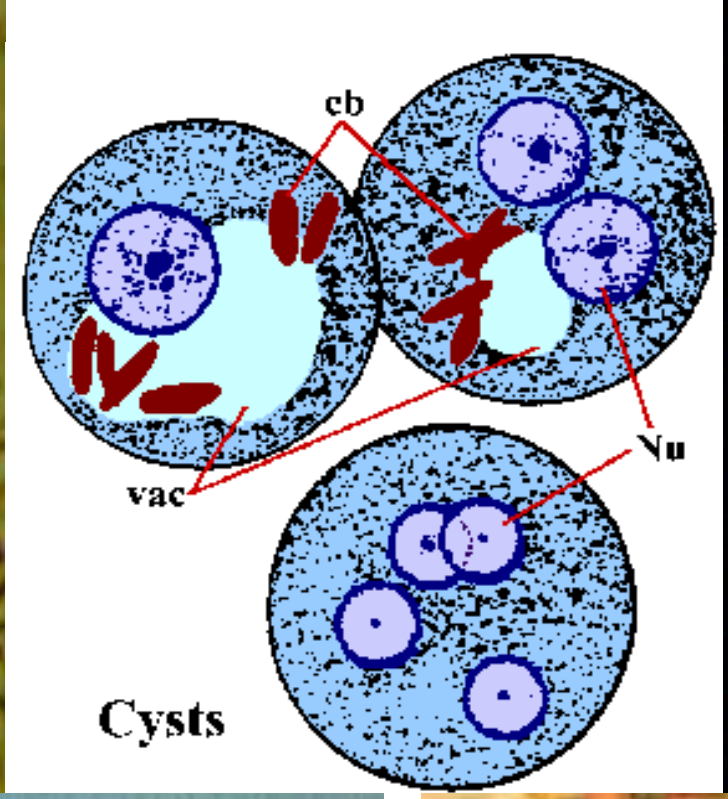
Macroscopic Examination -

- Consistency, Colour, Odour, blood or mucous
- Adult helminths – A.lumbricoides, E.vermicularis, segments of Tapeworms

Microscopic Examintion -

- Saline wet mount
- Iodine wet mount
- Stains – Iron-haematoxyline stain, Trichrome stain, Modified acid-fast stain


Image from DPDx, the CDC Parasitology Website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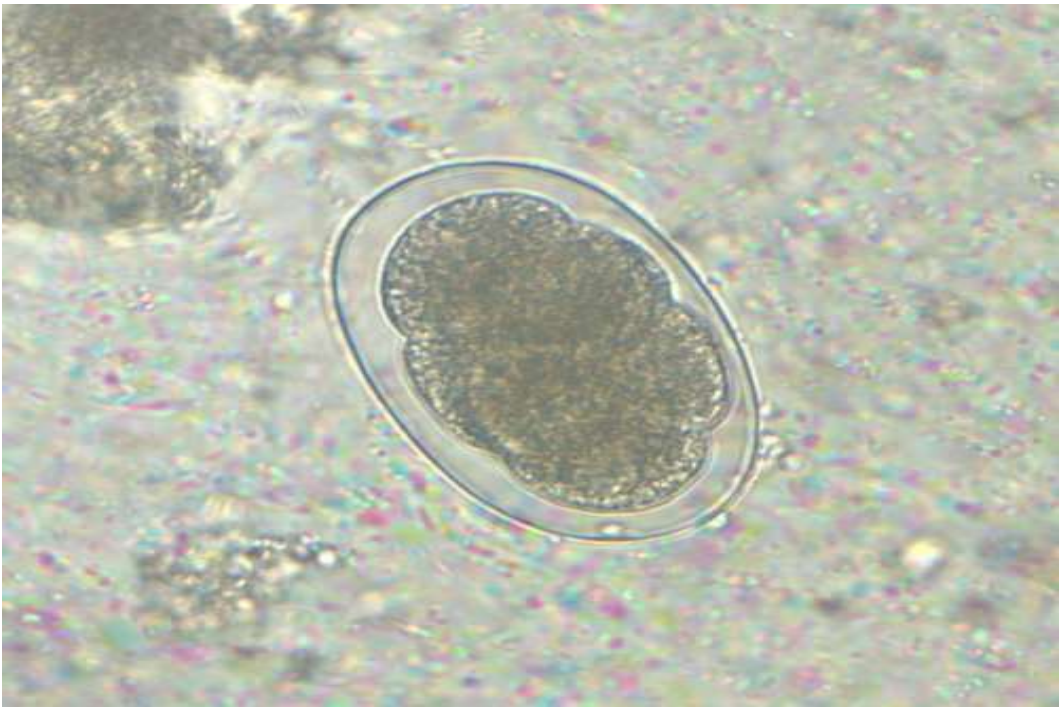


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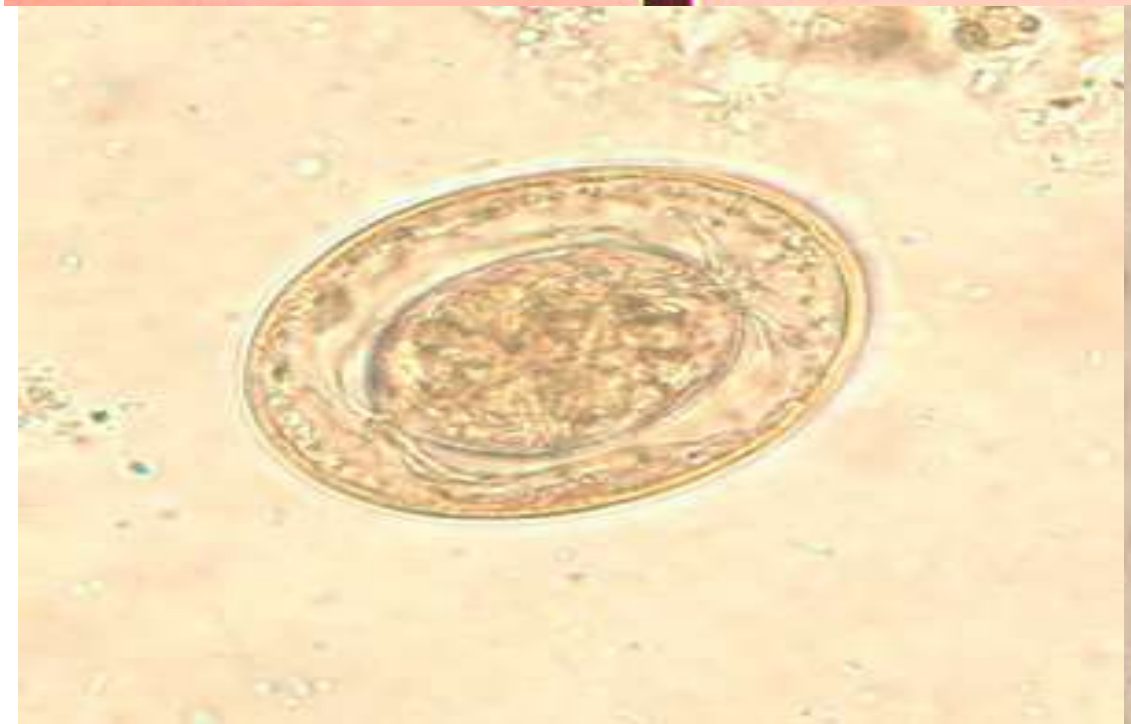


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CONCENTRATION METHODS :

- Floatation Technique
- Sedimentation Technique

FLOATATION TECHNIQUE :

SATURATED SALT FLOATATION TECHNIQUE:

- All the helminthic eggs float except unfertilized eggs of A.lumbricoides, eggs of taenia and all intestinal flukes

ZINC SULPHATE (33%) CENTRIFUGAL FLOATATION TECHNIQUE –

- Concentrates cysts of protozoa, eggs of nematodes and small tape worms

SEDIMENTATION TECHNIQUE :

- Simple sedimentation
- Formalin-ether sedimentation

FORMALIN-ETHER SEDIMENTATION -

- Stool + 10ml water ----> filtrate ----> centrifuge x 2000rpm x 2min ----> discard supernatant
- Sediments + 10ml saline ----> centrifuge ----> discard supernatant
- Sediments + 7ml formalin saline ----> stand for 10min or longer ----> +3ml ether ----> mix it
- Centrifuge x 2000rpm x 2min

Four layers --- ether --- debris --- formalin --- sediment

Good method – Hypertonic sol. rupture the cysts and eggs

QUANTIFICATION OF WORM BURDEN :

- Direct smear egg count
- Stoll's method

Direct smear egg count -

- 2mg of faeces in a drop of saline
- Examine under low power
- Count the no. of eggs and calculate it per gram

STOLL'S METHOD -

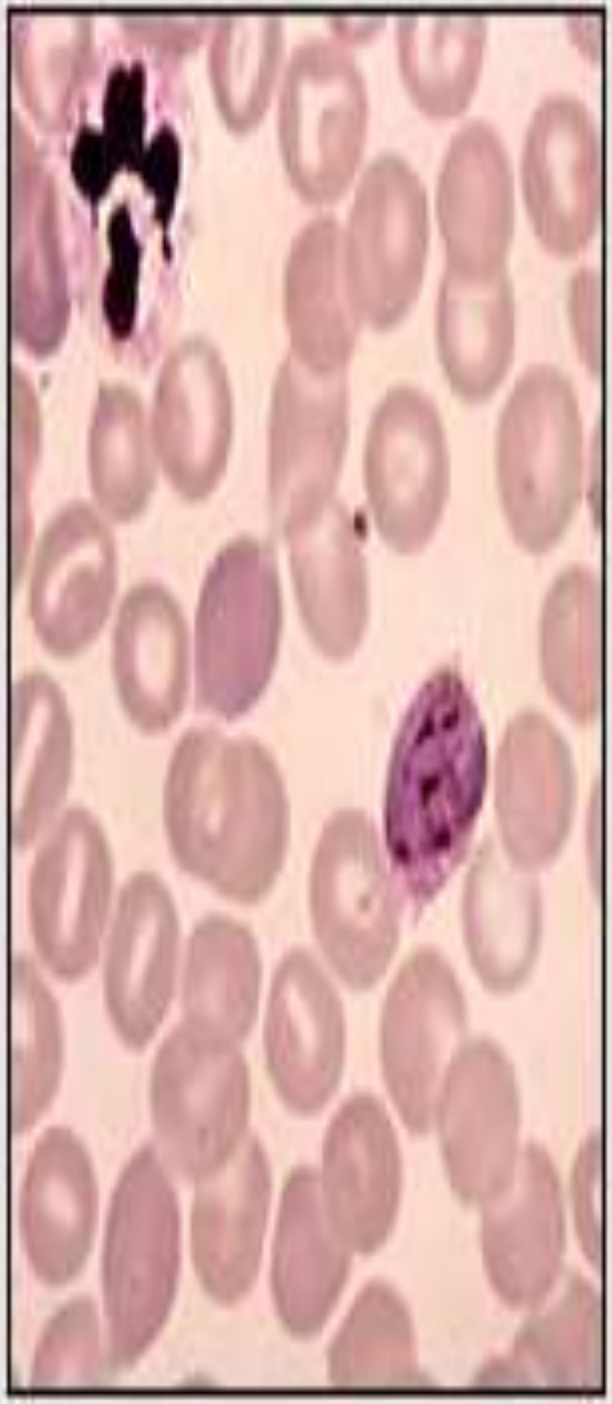
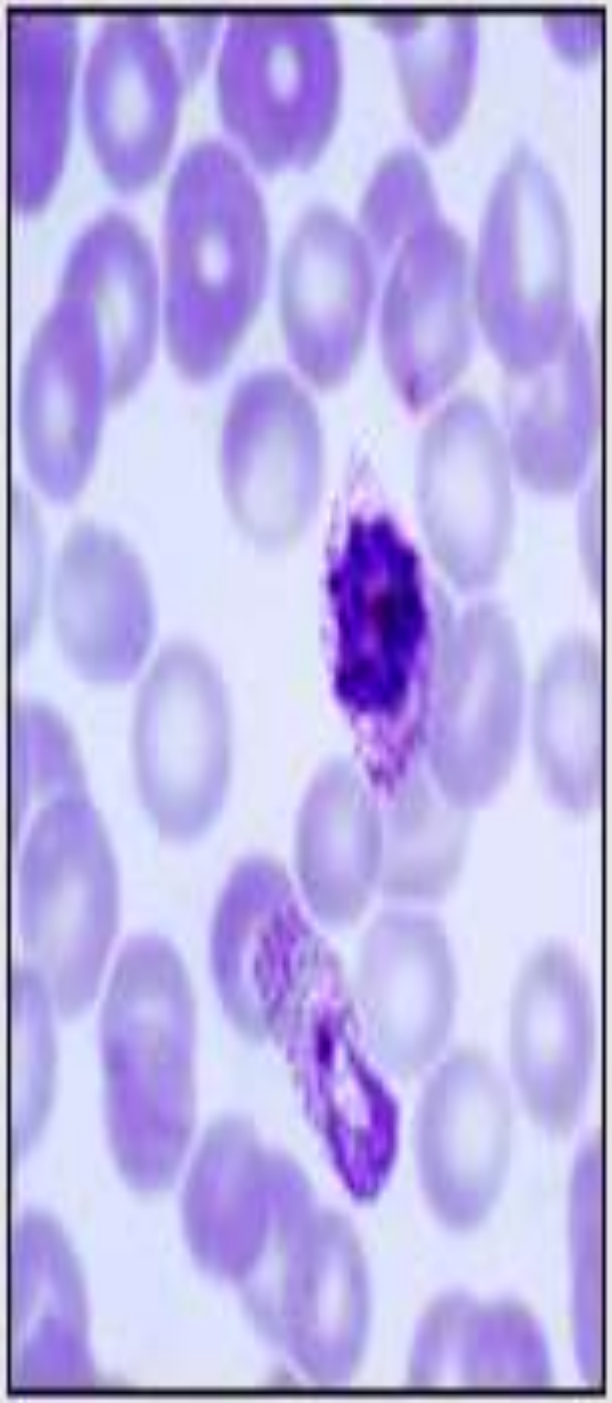
- 4gm of faeces + 56ml N/10 NaOH --- mix well
- Take 0.075ml on glass slide
- Count the eggs under low power (a)
- (a) x 200 = eggs / gm x 24 hr faecal sample

CORRECTION FACTOR (C.F)

- Mushy-formed stool – **C.F – 1.5**
- Mushy stool – **C.F – 2**
- Mushy-diarrhoeic stool – **C.F – 3**
- Frankly diarrhoeic stool – **C.F – 4**
- Watery stool – **C.F - 5**

In Blood :

- Wet mount – Trypanosomes and Microfilariae
- In Pbf – Thin & thick smear
- Staining – Leishman stain, Giemsa stain, Field stain, J.S.B stain
- Plasmodium spp., L.donovani, microfilariae of W.bancrofti


BLOOD CONCENTRATION METHODS :

MICROHAEMATOCRIT CENTRIFUGATION –

- For MP and trypanosome

TRIPLE CENTRIFUGATION –

- 9ml blood + 1ml of 6% sod.citrate – centrifuge 100g x10min
- Supernatant -- centrifuge 250g x10min
- Supernatant -- centrifuge 700g x10min
- Sediments examined for trypanosomes

BUFFY COAT CONCENTRATION –

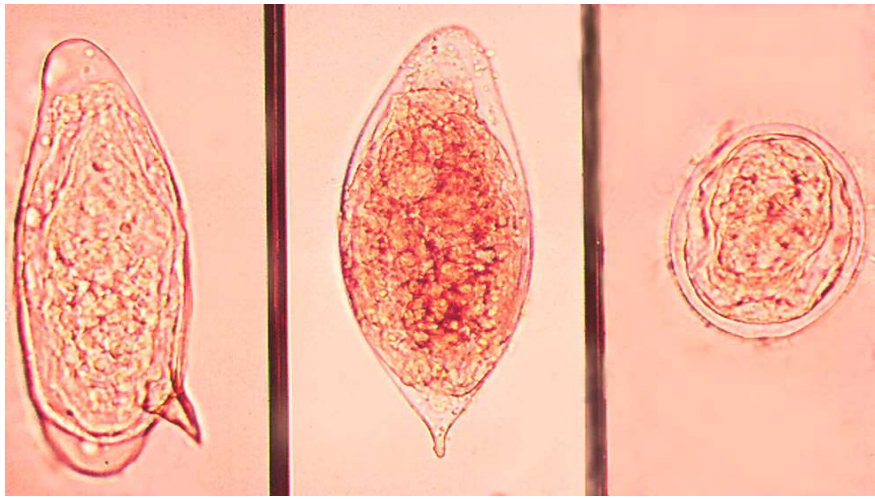
- 5ml citrated blood
- For L.D, M.P, Trypanosomes

MEMBRANE FILTRATION -

- For microfilariae in blood

IN URINE :

- Trophozoites of T.vaginalis, eggs of S.haematobium



GENITAL SPECIMENS :

- Trophozoites of T.vaginalis

CSF :

- Trophozoites of N.fowleri, Acanthamoeba spp., B.mandrillaris

SPUTUM :

- Eggs of Paragonimus westermani, E.histolytica
- During migratory phase - larvae of A.lumbricoides, Ancylostoma duodenale, Necator americanus, S.stercoralis

TISSUE BIOPSY & ASPIRATION :

- E.h from liver abscess
- G.lamblia from bile
- larvae of T.spiralis, T.solium in the muscle biopsy
- Scolices and brood capsules in the fluid aspirated from hydatid cyst

CULTURE :

- E.h & G.l in stool
- Leishmania spp. in blood

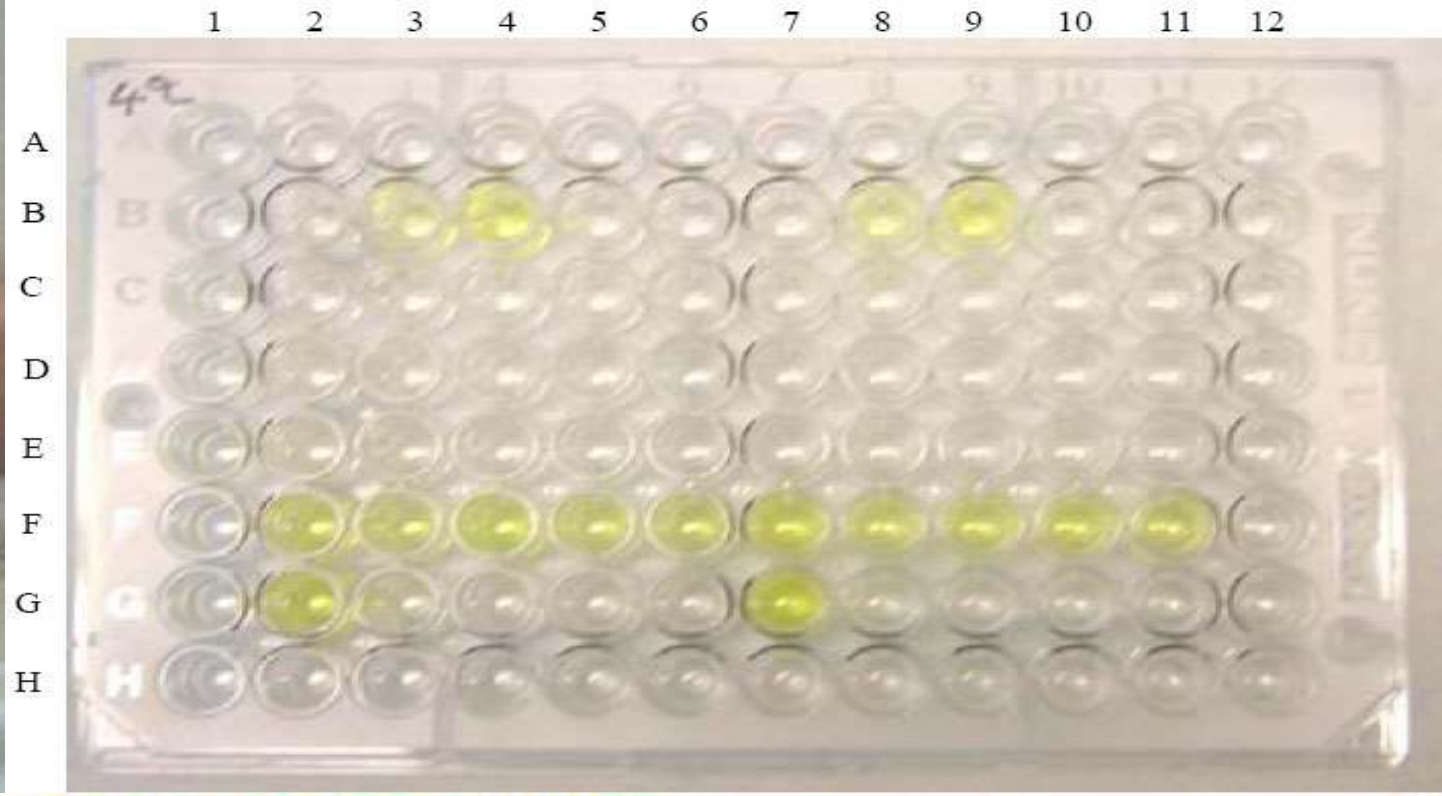
IMMUNODIAGNOSIS :

Skin Tests – By Intradermal injection- Immediate & Delayed hypersensitivity reaction

Serological Tests – Detection of antibodies or antigens by ELISA, RIA, Agglutination Tests, CFT, IHA etc.

MOLECULAR METHODS :

DNA probes and Polymerase chain reaction (PCR)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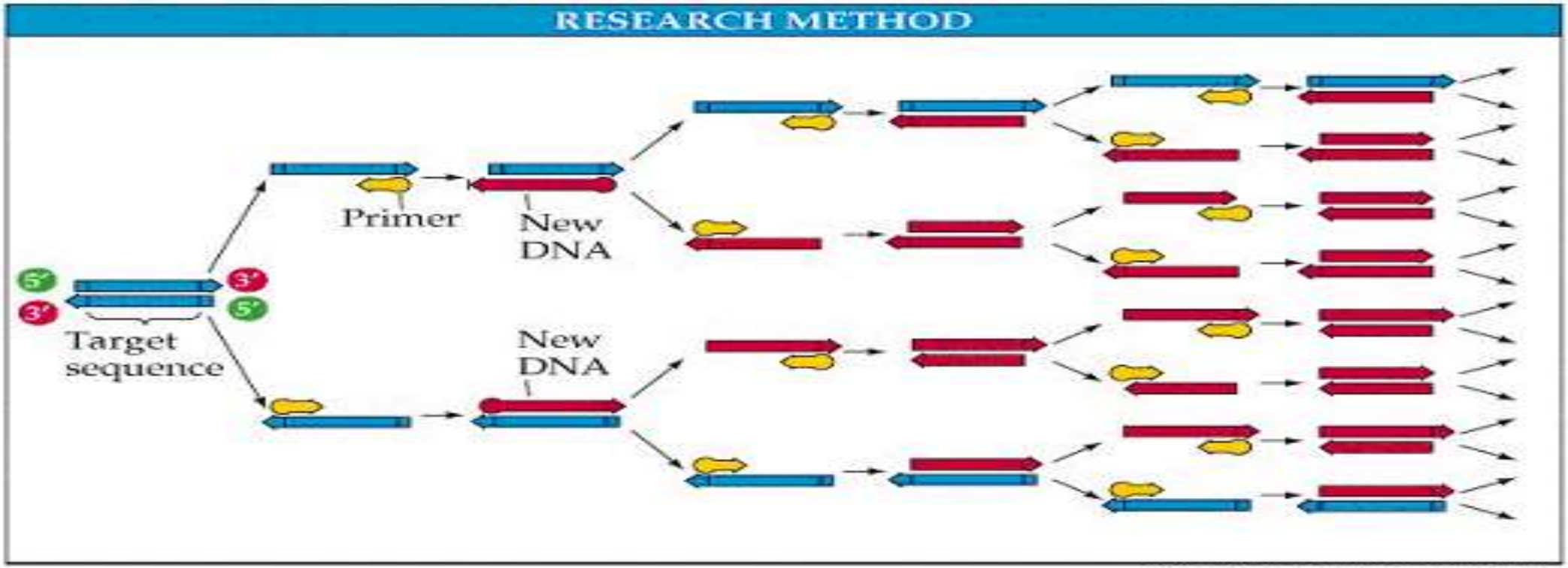
RESEARCH METHOD
Primer
New DNA
Target sequence
New DNA
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