Diagnosis of the Parasitic infections

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The Reality of Parasites

- 1.3 billion persons infected with Ascaris (1: 4 persons on earth).
- 300 million with Schistosomiasis.
- 100 million new malaria cases/ year.

Diagnosis of Parasitic Infections

1. Clinical
2. Laboratory

Purpose of laboratory diagnosis :

- Confirmation of clinical suspicion.
- Identification of unsuspected infection.

Collect the Information of the Patient

1- Provisional diagnosis

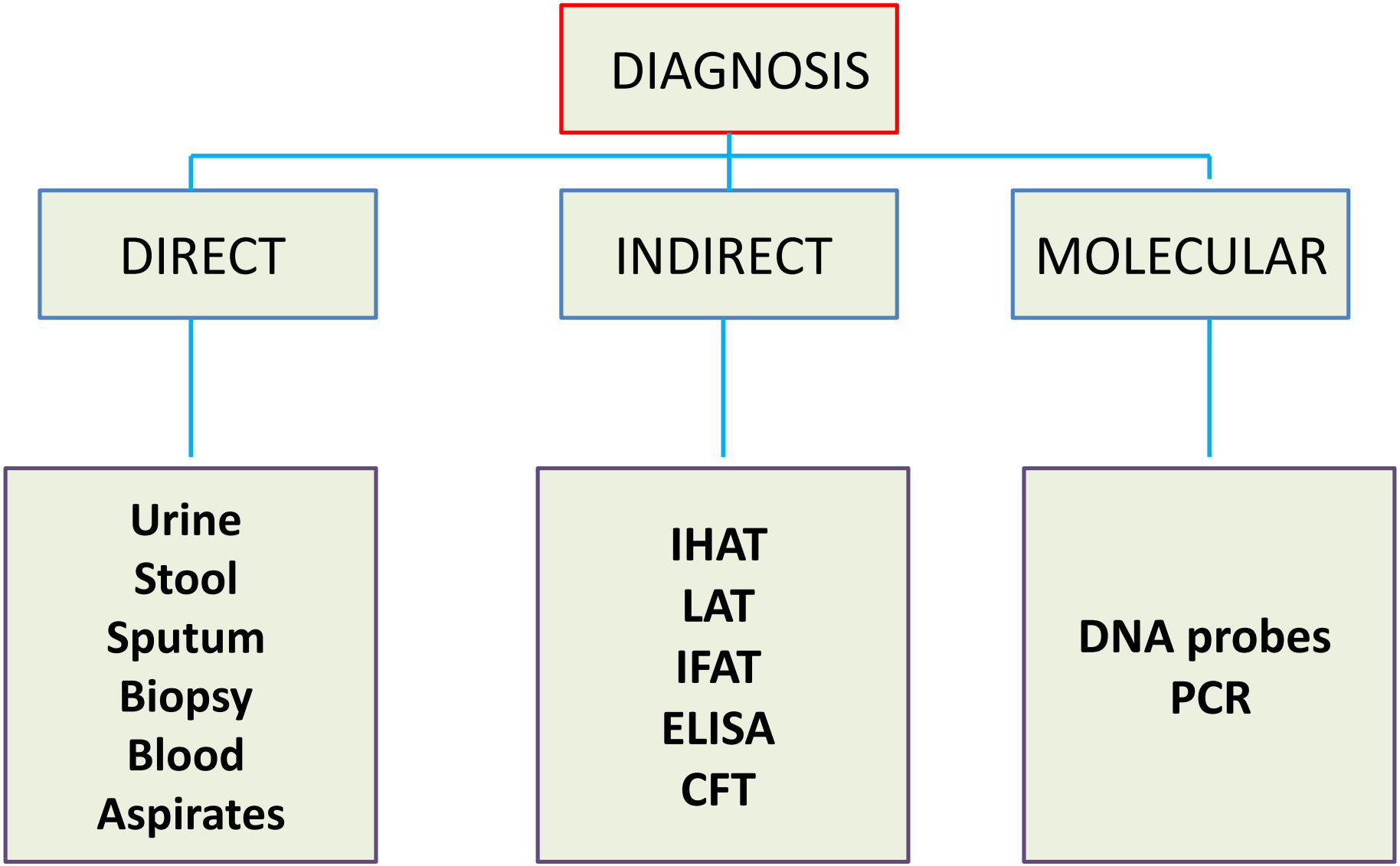
a. History (Age, occupation, residency, previous infection).
b. Complaint .
c. Clinical examination.

2- Confirmed diagnosis:

a. Laboratory investigations .
b. Radiology .
c. Surgical intervention (Exploratory)

Specimens

- Stool.
- Blood.
- Serum and plasma.
- Others (anal swab, duodenal aspirate, sputum, urine, urogenital specimen).
- Tissues and aspirates.


DIAGNOSIS
DIRECT
INDIRECT
MOLECULAR
Urine
Stool
Sputum
Biopsy
Blood
Aspirates
IHAT
LAT
IFAT
ELISA
CFT
DNA probes
PCR

Urine examination

Parasites detected in urine :

Helminths:

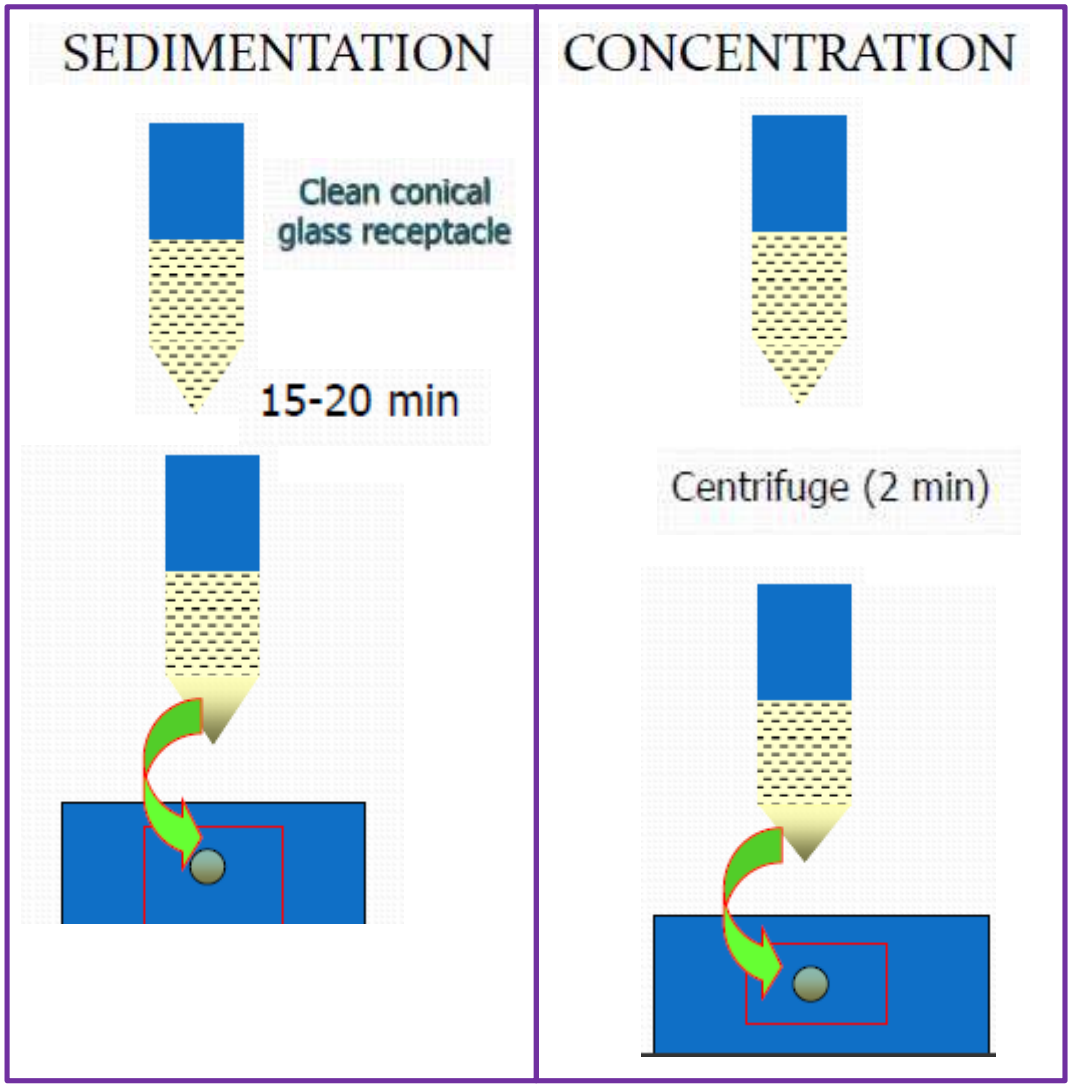
- Schistosoma haematobium eggs.
- Enterobius vermicularis eggs in female patients.
- Microfilaria of Wuchereria bancrofti.

Protozoa:

- Trichomonas vaginalis trophozoite in female patients.
- Temporary stains, such as methylene blue is helpful to see *T. Vaginalis.*

Note: Urine specimen should be centrifuged at 400 × *g*, the sediment mixed with a drop or two of saline, and examined by wet mount.

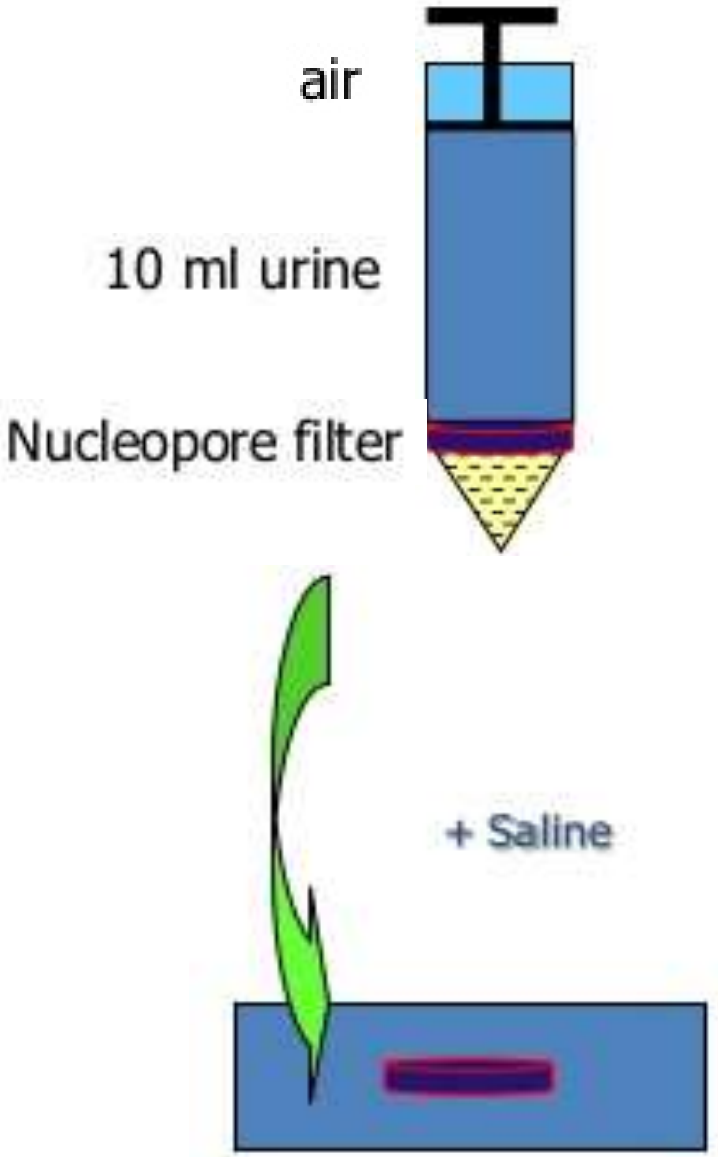
Urine examination



Urine examination

Other techniques:

- **Membrane Filter technique:**
  - For concentration of Schistosoma eggs.
  - Fill a syringe with urine, pass the urine through a filter.
  - Remove the filter and place it on the slide, and examine it microscopically.



Stool examination

Sample collection:

- Sample is collected in clean, dry container
- Handled carefully.
- Collect it into wide mouth,clean, sterile,leak proof container
- Samples in some cases fresh (amoeba, ciliates).
- Do not referigerate stool.
- Liquid and soft stool examined within 15 min.
- Not mixed with urine or disinfectant (as they will kill trophozoites).

Preservation of stool specimens:

Aim:

- To preserve protozoan morphology.
- To prevent the continued development of some helminthic eggs and larvae.
- The most common preservative used is 10% formalin.

Stool examination

Microscopic Examination of Faecal Specimens:

1- Direct Smears.

2- Direct wet mount

3- Concentration methods.

Stool examination

Direct Smears.

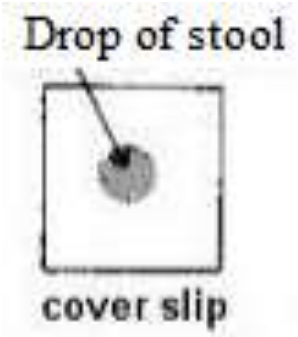
Principle

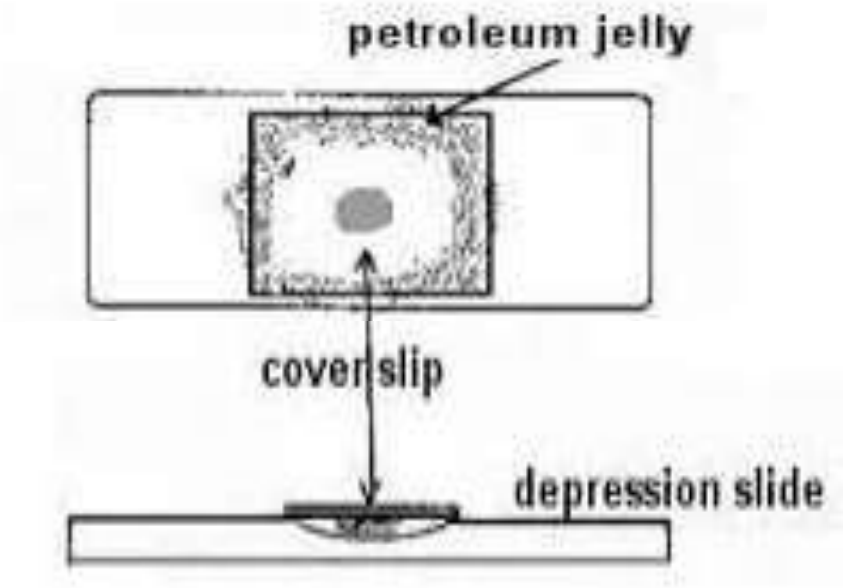
- To assess the worm burden of a patient
- To provide a quick diagnosis of a heavily infected specimen
- To check organism motility

Stool examination

Direct wet mount:

- To detect motile protozoan trophozoites.
- Small amount of faeces
- Few drops of saline
- Sometimes add lugol's iodine (nuclear details, glycogen vacuole in cyst).
- Protozoa (trophozoite), cyst, eggs and larva of helminths.





Stool examination

Concentration methods

- Used if parasites are scanty in the sample.
- Two types:

1- Floatation (eggs and cyst float , solution of high specific gravity)

i. Saturated sodium chloride
ii. Zinc sulphate centrifugation floatation (cyst, nematodes).

2- Sedimentation (solution of low specific gravity):

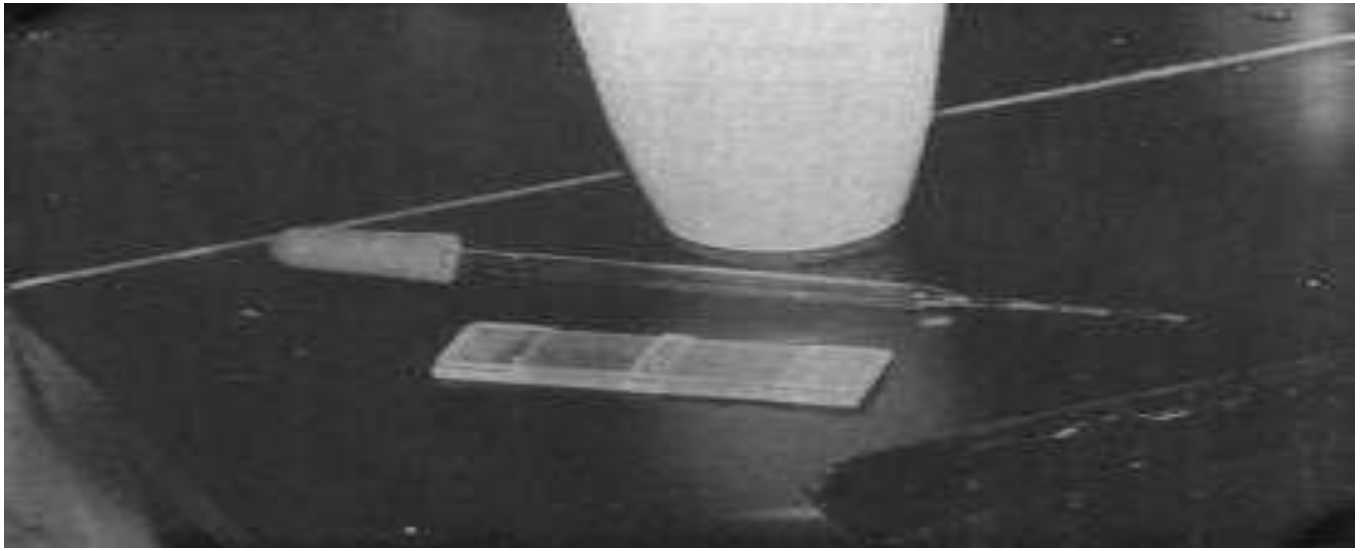
formol ether

Egg count in 1 gram

Stool examination

Concentration methods

Stoll's technique for counting helminth egg



3 gm stool and 42 ml water

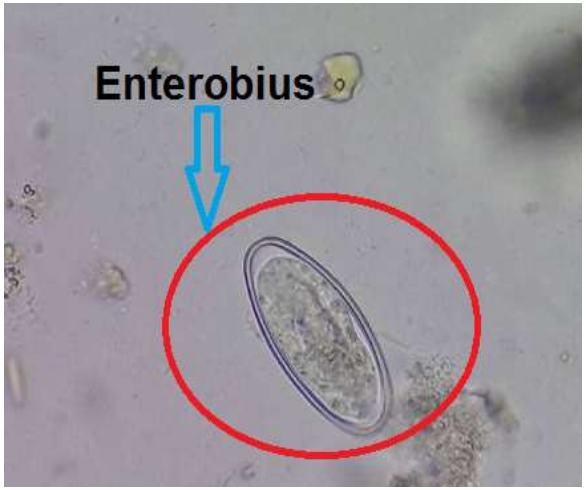
0.15 ml on slide

Multiply result in 100

Number in 1 gm

Stool examination

Microscopic Examination of Faecal Specimens: Direct Smears



Ascaris egg

Sputum examination

Sputum examination

- ✓Abnormally, it is purulent, bloody, contains rusty brown particles (Paragonimus).

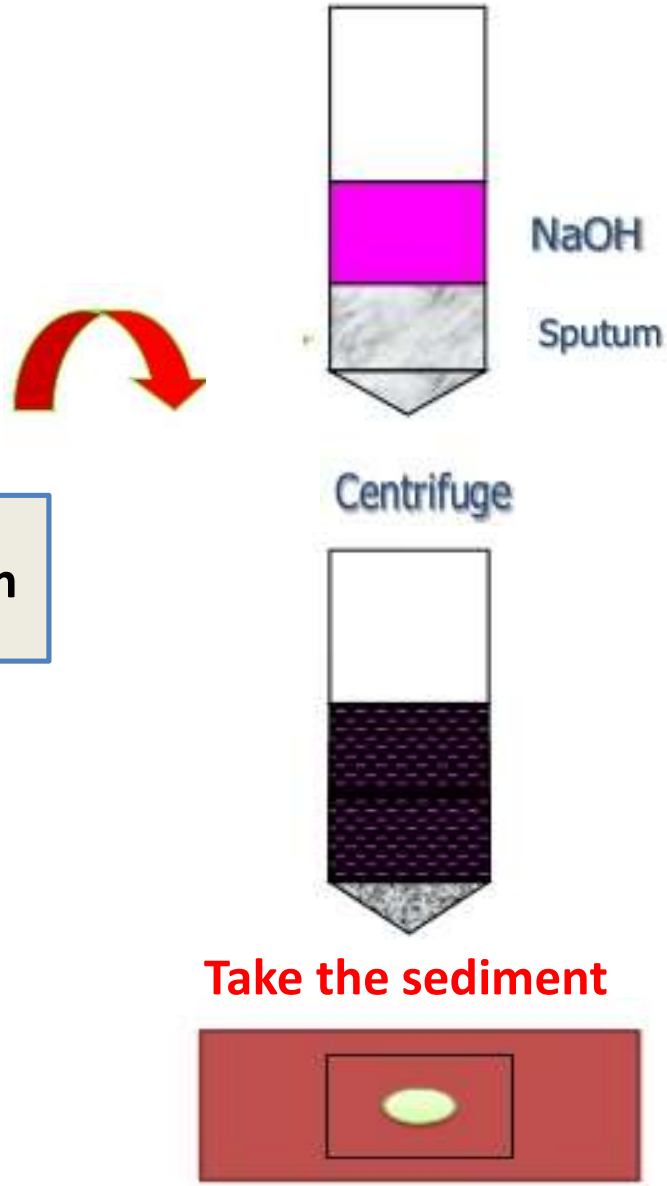
Technique for examination:

- ✓Add on a sputum sample equal volume of NaOH to dissolve the mucus.
- ✓Leave this combination for a while, then centrifuge at 200xg for 5 minutes, then examine the sediment.
- ✓The specimen can be preserved in 10% formalin and a formalin-ethyl acetate

Sputum examination

Parasitology

- Macroscopic
  - Appearance
    - Bloody (Parag)
    - Rusty brown (Parag)
- Microscopic
  - Concentration



Sputum examination

Parasites that could be detected in sputum:

1. The inhabitant in the lung:
   - ✓ Paragonimus
2. Migratory larvae:
   - ✓ Ascaris
   - ✓ Hook worm (Ancylostoma)
   - ✓ Strongyloides.
3. Parasites causing pathology in the lung:
   - ✓Trophozoites of Entamoeba histolytica.
   - ✓Hydatid sand due to rupture of hydatid cyst that could be present in the lung.

Blood examination

- Fresh capillary blood of finger or ear lobe
- Venous blood collected in EDTA (anticoagulant)

Blood sample will be used for :

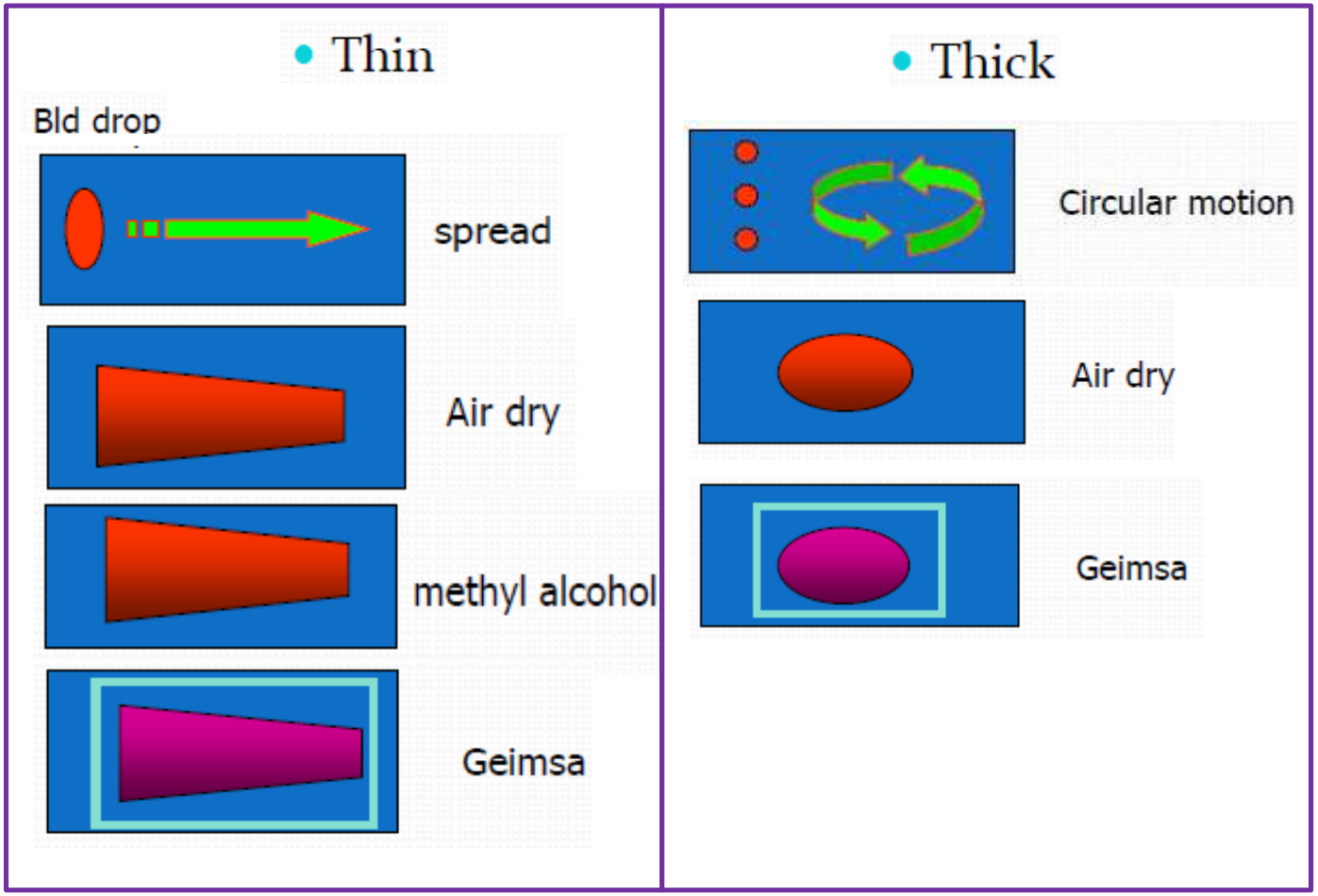
- Microscopic examination(Thin Smear, Thick smear, Wet mount for microfilaria).
- Molecular diagnosis
- Detection of parasite antigen
- Isolation of organisms
- Special tests

Blood examination

Two types of blood films can be made, thin and thick blood films:

✓ Thick films.

✓Thin films.



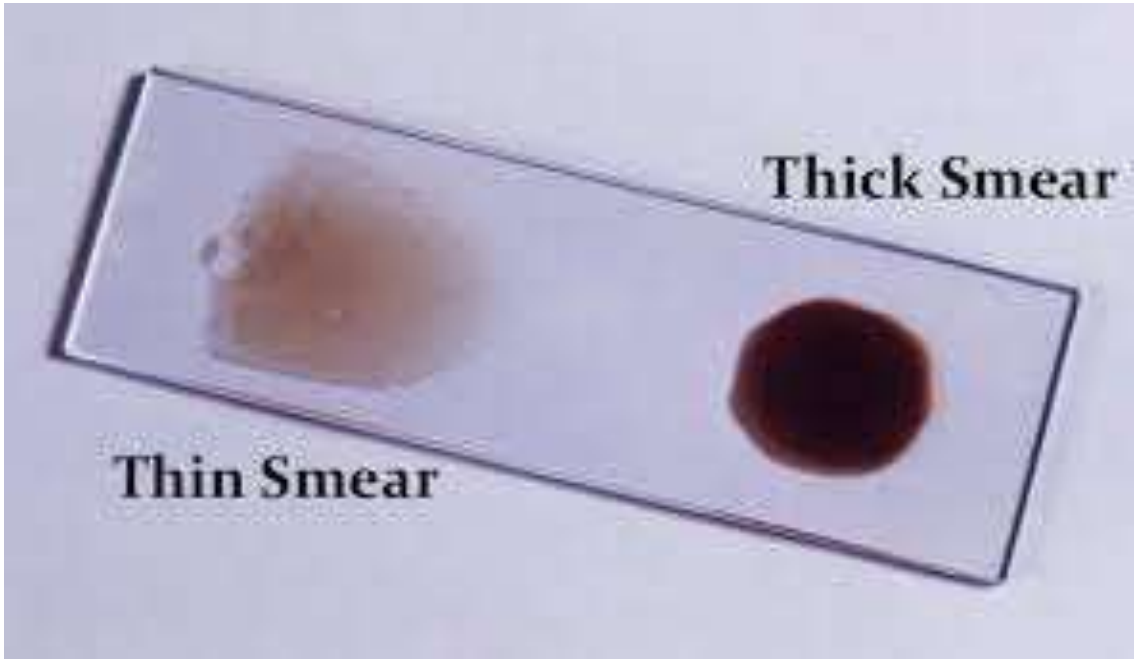
Blood examination

Thick blood film

- Screen large amount of blood (light infection)
- Can be stained latter

Thin blood film

In malaria Parasitized red blood cells



Blood examination

Parasites that could be detected in blood film:

- Malaria
- Trypanosoma (African and American).
- Microfilaria of all types Filaria except Onchocerca volvulus.
- Indian type of Leishmania donovani.

Examination of other Specimens

1. **Lung and Liver**

- Aspiration from lung and liver could be examined for:
  - ✓Pneumocytosis
  - ✓Amoebiasis

Technique: The use of proteolytic enzymes is recommended to free the organisms from the aspirate material

  - ✓Hydatid Disease

2. **Lymph nodes, Spleen, Liver, Bone Marrow and Spinal Fliud: Aspirated material may be examined for presence of trypanosomes, leishmanial forms and amoebae.**
3. **Cutaneous Ulcers : Leishmaniasis**

Harmful effects of the parasite on the host

- Many parasites cause harmful effects to their host, Such effects comprise:
  - **Wasting (cachexia)**
    African trypanosomiasis and leishmaniasis may lead to severe loss of weight in both animals and man.
  - **Superinfections**
    In the case of (muco)cutaneous leishmaniasis ulcerations may lead to superinfections with bacteria

Harmful effects of the parasite on the host

- **Immunodepression**
  Malaria, bilharziosis, etc., lead to a certain degree of immune suppression which renders the infected host more susceptible to other diseases.
- **Allergic reactions**

- **Anaphylactic shock** : may be induced by the sudden release of large amounts of parasite internal antigens into the bloodstream.

Harmful effects of the parasite on the host

- **Mechanical damage**
  - In the case of malaria the lysis of erythrocytes does lead to haemolysis and anaemia.
  - In the case of ascaris infection the presence of the worms in the small intestine may lead to intestinal occlusions
- **Reflexes** (intestinal contractions-ascaris)
- **Irritation of skin and tissues** by ecto- and endoparasites