DIAGNOSTIC PARASITOLOGY
The following are the main ways in which parasitic infections are diagnosed in the laboratory:

- **BY MICROSCOPICAL EXAMINATION**
  The majority of intestinal, urinary and blood parasites can be detected microscopically in unstained or stained preparations, either directly or following concentration.

- **BY CULTURAL TECHNIQUES**
  Only a minority of parasitic infections are diagnosed routinely by cultural techniques.

- **BY IMMUNODIAGNOSIS**
  Serologic methods are available in cases such as toxoplasmosis, trichinosis, echinococciosis, cysticercosis, chronic schistosomiasis, or extra-intestinal amebiasis, where the organism is not readily demonstrated.
approximately 100 species of animal parasites can infect the body
• about 70 of these are common and considered important
• more than half of these can be detected by examination of fecal specimens because they reside in the gastrointestinal tract itself or are so located that they or their progeny finds their way into the alimentary canal.
Feces collection, handling and shipment

- The importance of properly collected specimens for diagnosis cannot be over emphasized. Inadequate, old or improperly preserved samples are usually of little or no value in establishing a diagnosis and may lead to erroneous conclusions.
Feces collection, handling and shipment

- Container for stool specimen

- colour
- consistency (formed, semifomed, unformed, fluid)
- whether it contains blood, mucus, pus
- whether it contains worms (A. lumbricoides, E. vermicularis, tapeworm segments)

Bristol Stool Chart
- Type 1: Separate hard lumps, like nuts (hard to pass)
- Type 2: Sausage-shaped but lumpy
- Type 3: Like a sausage but with cracks on its surface
- Type 4: Like a sausage or snake, smooth and soft
- Type 5: Soft blobs with clear-cut edges (passed easily)
- Type 6: Fluffy pieces with ragged edges, a mushy stool
- Type 7: Watery, no solid pieces, Entirely Liquid
Principle of stool sampling collection, handling and processing for parasites examination

Collection and handling:
- Minimum 3 samples
- Clean, water-tight container with a screw-cap lid
- The smallest acceptable amount of stool is 2-5g
- Urine should not be allowed to contaminate the specimen
- The specimen container should be labeled correctly: patients’ name, date and time of sample collection, test/tests requested, suspected diagnosis, clinical findings, travel history
The ideal specimen is a freshly collected stool sample. 5-10% formalin, PVA - polyvinyl alcohol, MIF - merthiolate iodine formalin.

Reason for their use:
(a) removal of debris from the sample
(b) parasites are often present in low numbers and need to be condensed into one area of the sample.
Concentration methods

- **Formalin-ether (or ethyl acetate) concentration procedure:**
  After centrifugation of the sample, the parasites present are heavier than the solution and settle in the sediment of the tube.

- **Zinc sulfate flotation technique:**
  After 15 min, parasites come out on the surface of the solution.

Formalin-ethyl acetate concentration procedure:
4 layers after centrifugation
Direct wet preparations

**Saline** wet preparations: good for the recovery of the motile protozoan trophozoites

**Iodine** wet preparations: study of the detailed morphology of protozoan cysts
Permanent stains

- Trichrome stain
- Giemsa stain
- Iron hematoxylin stain
- Modified acid-fast stain (modified Ziehl-Neelsen stain)

*Cryptosporidium, Isospora, Cyclospora* (requires specific request)
Immunologic diagnosis

- Detection of Ag from specific parasites in the stool:
  - ELISA
  - rapid tests

(1) ELISA plate is coated with a capture antibody; (2) Sample is added, and the respective antigen present binds to capture antibody; (3) Biotin-conjugated secondary detection antibody is added, and binds to the antigen captured by the first antibody; (4) Enzyme is added and binds to the biotin conjugated detection antibody; (5) Coloured product is formed in proportion to the amount of antigen present in the sample; The reaction is terminated by addition of acid and absorbance is measured at 450 nm;
Parasite ova

- Clonorchis sinensis
  - 27-35 μm long
  - 12-14 μm wide

- Taenia spp.

- Ascaris lumbricoides (fertile egg)
  - 45-75 μm long
  - 35-50 μm wide

- Hookworm
  - 31-43 μm diameter

- Hymenolepis nana
  - 50-54 μm long
  - 20-23 μm wide

- Trichuris trichiura

- Diphyllobothrium latum
  - 58-75 μm long
  - 40-50 μm wide

- Hymenolepis diminuta
  - 70-85 μm long
  - 60-80 μm wide

- Enterobius vermicularis
  - 70-85 μm long
  - 60-80 μm wide
SPUTUM SPECIMENS
- These should be collected in suspected cases of paragonimiasis along with stool specimens.
- Pulmonary amebiasis and echinococcosis may also be detected by the examination of sputum.

URINE SPECIMENS
- Urine specimens, preferably the one passed about or shortly after noon, preserved in formalin is recommended for *Schistosoma hematobium*.
- Fresh urine specimens, preferably the first portion of voided urine, should be examined immediately for *Trichomonas vaginalis*.

PERIANAL SWABS
- For the detection of *Enterobius vermicularis* (pinworm).
BLOOD

- Stained blood films for **malaria** should be made from a fresh blood sample without anticoagulant.
- **Trypanosoma**
- **Filariae**

Giemsa staining

Thick and thin blood smears
Plasmodium falciparum

Thin blood film

Thick blood film
Blood and tissue helminths

- Thin and thick blood film (*Filariae*)
Molecular techniques - PCR

Detection of protozoa-helminths in clinical specimens and for identification of isolated agent.

- Click to edit Master text styles
  - Second level
    - Third level
      - Fourth level
        - Fifth level
The expected turnaround time is as follows:

<table>
<thead>
<tr>
<th>Test</th>
<th>Turnaround Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ova and Parasites</td>
<td>2-4 days after receipt in lab</td>
</tr>
<tr>
<td>Pinworm</td>
<td>1-2 days after receipt in lab</td>
</tr>
<tr>
<td>Cryptosporidium</td>
<td>2-4 days after receipt in lab</td>
</tr>
<tr>
<td>Malarial Smear</td>
<td>1-2 days after receipt in lab</td>
</tr>
</tbody>
</table>

Samples will be rejected if they are:

- **Unlabeled** - All specimens MUST have a unique patient identifier.
- **Insufficient in Quantity** - No specimen received, no specimen in container, or insufficient specimen to perform testing.
- **Improperly Preserved** - Specimens for Ova & Parasite must be received in both PVA and Formalin transport tubes.
- **Damaged** - Specimen leaked or broken in transit.
- **Too Old** - Preserved samples greater than 7 days old are unreliable specimens for testing. Blood specimens more than 24 hrs old will not be accepted.