Diagnosis of Parasites

3rd stage/2nd Semester/2024-2025

Lec.2 Methods of parasites diagnosis in Lab.:

Generally, Laboratory diagnosis of parasitic diseases may depends on one or more of the following methods:

1-Microscopical methods
2-Cultural methods
3-Serological tests
4-Skin test
5-Moleculer methods
6-Imaging methods.
7-Hematological methods.
8-Animal inoculation.
9-Xenodiagnosis.

1-Microscopic Methods:

What types of specimens that are usually adopted to establish a parasitic diseases microscopically in lab.?

a-Stool b-Blood c-Urine d-Sputum e-Cerebrospinal fluid (CSF.) f-Tissue and aspirate g-Genital specimens.

What human parasite can we detect when examine each structure of the followings?

a- **Stool examination:** It is made to detect intestinal parasitic infections, like:
Eggs of intestinal helminthes: round worms (e.g. *Ascaris lumbricoides, Ancylostoma*) , tapeworms (e.g.*Taenia* spp.). Larvae of nematodes (e.g. *Strongyloid stercuralis*), Cyst and trophozoites of intestinal protozoan parasites (e.g.*Giardia lamblia*, *Entamoeba histolytica*).

b-**Blood examination**: Useful to detect parasite those circulate in blood stream (e.g. Malaria).

c-**Urine examination**: egg of *Schistosoma hematobium*, filarial larvae of *Wuchereria bancrofti*, trophozoite of *Trichomonas vaginalis*.

D-**Sputum examination**: Larvae of roundworms (e.g. *Ascaris lumbricoides*, *Strongiloid stercuralis*. Eggs of filarial worms (e.g. *Paragonemus westermani*).

e-**Cerebrospinal fluid (CSF) examination**: Nematodes (e.g. *Angiostrongylus*). Amoebas(e.g. *Naegleria, Acanthamoeba, Balammuthia*), blood and tissue flagellates (e.g. *Trypanosoma brucei*)

f- **Tissue and aspirate examination**:

Biobsy: *Trichinella* and *Schistosoma* eggs could found in muscle biopsy,

Brain autopsy: *Nigleria* and *Acanthamoba* trophzoit.

Aspirated materials: *Giardia* trophozoites could be detected in Duodenal aspiration, *Lieshmania donovani* amastigote could be found in bonmarrow and lymph glands and spleesn aspiration.

Abscess: *Entamoeba histolytica* tophozoites could be found in hepatic abscess.

g-**Genital specimens examination**: ***Tricumonas vaginalis*** trophozoites could be found in vaginal and urethral discharges. *Enterobius vermicularis* eggs could be found in vulvar area swab.

2-Cultural methods:

Not all the parasite able to be cultured, but some of them could be cultured in specific culture medias, either axenic, or polyxenic cultures. e.g. *Lieshmania, Trypanosoma* (blood and tissue flagellates), *Entamoeba* (intestinal amoeba).

Note:

There are three basic types of culture systems *in vitro*: **xenic**, in which the parasite is grown in the presence of an undefined flora; **monoxenic**, in which the parasite is grown in the presence of a single additional species; and **axenic**, in which the parasite is grown in the absence of any other metabolizing cells.

3-Serological tests:

They are helpful in diagnosis of numerous protozoan and helminthic infections, especially, those difficult to be identified microscopically. The serodiagnosis of parasitic diseases either depends on:

a -Antigen detection. or b-Antibody detection.

Examples for antigen detection:

1-Plasmodium falciparum lactate dehydrogenase antigen (PLDH) and histidine-rich protein2 (HRP-2) antigen are malaria antigens which are detected by immunochromatographic technique.

2-Filarial antigens are detected in case of acute infections using (enzyme linked immunoborbent assay (ELISA) technique.

Examples for antibody detection techniques:

1-Complement fixation test (CFT)
2-Indirect hemagglutination (IHA)
3-Rapid immunochromatographic test (ICT)
4-Enzyme-Linked immunosorbent assay (ELIZA)

4-Skin test for parasitic diseases infection:

Is performed by injecting parasite antigen intradermally, then observing the dermal reaction. If **immediate hypersensitivity reaction occurs**, red wheal and flare response will be seen within 30 minutes after the injection. Whereas **delayed hypersensitivity reaction** would be occur after 48 hrs. in which erythema and induration could be observed.

5-Moleculer diagnosis:

The following techniques are very sensitive and specific for human parasite diagnosis:
1-Dexoribonuclic acid (DNA) probes.
2-Polymerase chain reaction (PCR.)
3-Microarray technique.

6-Animal inoculation:

Blood and other body specimens could be inoculated in living lab animals to prove the presence of the following parasitic infections: Toxoplasmosis, Trypanasomiasis and babisiosis (is a malaria-like parasitic infection that habitat RBC, caused by the eukaryotic parasite *Babesia* in the phylum Apicomplexa. Human babesiosis is transmission via tick bite).

7-Xenodiagnosis:

is a diagnostic method used to document the presence of infectious disease microorganisms or pathogens by: exposing possibly infected tissue to a vector and then examining the vector for the presence of the microorganisms or pathogens it may have ingested. This process is commonly used to diagnose infections involving microorganisms such as trypanosomiasis infcecction (Infection with *Trypanosoma cruzi*).

8-Imaging techniques:

Are extensively used to diagnose varios parasitic infections like: Neurocysticercosis and hydatid disease manifestations (tapeworms manifastations).

The mostly used imaging techniques for detecting parasitic infections are: **X-ray, Ultrasonography, Computed tomography (CT.) and Magnetic resonancr emaging (MRI.)**

9-Hematological tests:

The following hematological symptoms could be observed upon some parasitic infections.

1-Anemia: is frequently found in case of malaria and hookworms infections.

2-Eosinophelia: is almost observed in cases of helminthes manifestation**.**

3-Hypergammaglobulinemia: occurs in case of visceral lieshmaniasis infections.

4-Leukocytosis: could be detected in case of amoebic liver abscess.

Notes:

Anemia: a blood disorder in which the blood has a reduced ability to carry oxygen. This can be due to a lower than normal number of red blood cells, a reduction in the amount of hemoglobin available for oxygen transport, or abnormalities in hemoglobin that impair its function.

Eosinophelia: is a condition in which the eosinophil count in the peripheral blood exceeds 5×10^{8}/L (500/μL).

Hypergammaglobulinemias: is a medical condition with elevated levels of gamma globulin. It is a type of immunoproliferative disorder. Most hypergammaglobulinemias are caused by an excess of immunoglobulin M (IgM).

Leukocytosis: is a condition in which the white cell (leukocyte) count is above the normal range in the blood. It is frequently a sign of an inflammatory response, most commonly the result of infection, like parasitic infections.