Chapters 21-26: 
Selected Eukaryotic Pathogens

1. Protozoan Pathogens
2. Fungal Pathogens
3. Parasitic Helminths

1. Protozoan Pathogens

Malaria (pp. 696-8)
Caused by protozoa in the genus *Plasmodium*:

- non-motile, obligate parasite
- 4 main *Plasmodium* species cause malaria:
  - *P. vivax*  
    - most common malaria pathogen
  - *P. falciparum*  
    - most deadly malaria pathogen
  - *P. ovale* & *P. malariae*  
    - cause milder form of malaria much like *P. vivax*
Transmission:
• vector transmission through the saliva of biting (female) mosquitoes (Anopholes)

Signs/Symptoms:
• Plasmodium life cycle involves infection and destruction of RBCs
• periodic fever, chills
• anemia can be severe
• tissue damage due to capillary blockage

Diagnosis:
• in most cases diagnosis is made through the microscopic examination of a blood smear

Treatment:
• quinine is the traditional medicine for malaria
  • causes death of merozoites in RBCs
• quinine derivatives chloroquine & mefloquine are more commonly used today

Prevention:
• elimination, avoidance of mosquito vectors
• an truly effective vaccine has yet to be produced

Trichomoniasis (pp. 802-3)
Trichomonas vaginalis, if present in the vagina, is usually kept in check by normal microbiota:
• disturbance of the normal microbiota and a rise in the normally acidic pH can result in overgrowth of this protozoan (trichomoniasis)

SYMPTOMS & SIGNS:
greenish discharge, itching & irritation

DIAGNOSIS: microscopic

TREATMENT: metronidazole (inhibits DNA synth. in anaerobes)
Trypanosome Pathogens

“Sleeping Sickness” (Trypanosoma brucei, pp. 660-61)

**TRANSMISSION:** tsetse fly (West & Central Africa)

**SYMPTOMS:** chancre at bite, fever, headaches, coma

- infection of CNS, can lead to death in weeks/months

**DIAGNOSIS:** serological

**TREATMENT:** eflornithine, eliminate vector

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Toxoplasmosis (pp. 695-96)

Caused by the protozoan *Toxoplasma gondii:*

**TRANSMISSION:** contact with cats; undercooked meat

**SYMPTOMS:** fetal damage during pregnancy

**DIAGNOSIS:** serological

**TREATMENT:** pyrimethamine

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Leishmaniasis (pp. 698-99)

Caused by protozoa in the genus *Leishmania:*

**TRANSMISSION:** sand flies (tropics, Mediterranean)

**SYMPTOMS:** chills, sweats, weakness; potential infection of visceral organs which can be fatal

**DIAGNOSIS:** microscopic

**TREATMENT:** miltefosine, antimony compounds, both with significant side effects
Other Protozoan Pathogens

**Giardiasis** *(Giardia lamblia, pp. 771-2)*
- **TRANSMISSION:** fecally contaminated water
  - e.g., drinking unboiled water when hiking, camping
- **SYMPTOMS:** diarrhea, flatulence lasting up to 6 weeks
  - adheres to intestinal wall, inhibits nutrient absorption

**Amoebic Dysentery** *(Entamoeba histolytica, pp. 773-4)*
- **TRANSMISSION:** fecally contaminated water
- **SYMPTOMS:** dysentery (diarrhea with blood, mucus)
  - feeding on intestinal wall, damage can be lethal
- **TREATMENT:** both are treated with metronidazole

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2. **Fungal Pathogens**
**Candida albicans** (pp. 801-2)

Can cause vaginal infections when the normal microbiota is disturbed by antibiotics, oral contraceptives, etc; “thrush” in oral cavity

**SYMPTOMS & SIGNS:**
- irritation & itching along with discharge
  - diagnosis is made by microscopic examination

**TREATMENT:**
- topical miconazole, nystatin;
- oral ketoconazole (all target ergosterol)

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**Dermatomycoses** (pp. 629-31)

Fungal infections of the skin, hair or nails due to species of the Ascomycote genera *Epidermophyton*, *Trichophyton* and *Microsporum*:

- “ringworm” or “jock itch”
  - thought to be due to parasitic worms in the past

**TRANSMISSION:** fomites such as towels, combs, etc
- require moisture to thrive

**TREATMENT:** topical agents that dry, acidify the body surface, miconazole, tolnaftate, griseofulvin administered orally (inhibits microtubules, mitosis)

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**3. Parasitic Helminths**
**Flatworm Pathogens**

**Tapeworms** *(Cestodes, pg. 774-6)*

**TRANSMISSION:** larvae in contaminated meat or fish
- inadequate cooking leads to infection

**SYMPTOMS & SIGNS:** minimal if present at all, little harm to the host beyond lost nutrients

**TREATMENT:** niclosamide (inhibits ATP production) and praziquantel (paralysis of flatworms)

**Schistosomiasis** *(blood fluke, pg. 701)*

**TRANSMISSION:** waterborne larvae penetrate skin
- feeds on blood in liver causing fever, abdominal sym.

**TREATMENT:** praziquantel

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**Roundworm Pathogens**

**Trichinellosis** *(Trichinella spiralis, pg. 776-8)*

**TRANSMISSION:** eating contaminated pork or wild game (common in animals fed “garbage”)
- inadequate cooking of meat leads to infection
- prolonged freezing of meat can kill the nematode
- larvae can encyst in muscle tissue for years

**SYMPTOMS & SIGNS:** if present can include fever, gastrointestinal symptoms, swelling around the eyes

**TREATMENT:** mebendazole (blocks glucose uptake by worms) & corticosteroids (reduces inflammation)
Filariasis (aka “elephantiasis”)  
(*Wuchereria bancrofti*, pg. 468)  

**TRANSMISSION:** larvae transferred by mosquitoes  
• live for years in lymphatic vessels, lymph nodes  
  causing inflammation & severe damage to tissues  

**SYMPTOMS & SIGNS:** lymphatic damage causes *lymphedema*, the gross swelling of lymphatic tissues  

**TREATMENT:** ivermectin (induces paralysis of larvae) & albendazole (inhibits microtubule formation, mitosis)  

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Key Terms for Eukaryotic Pathogens  
(Chapters 21-26)  

• lymphedema  
• dysentery  
• dermatomycoses