GENERAL CONCEPTS PERTAINING TO PARASITOLOGY

1. Is a type of symbiosis (two organisms interacting with each other) in which one partner (the parasite) benefits and the other (the host) is harmed.

Other kinds of symbioses include:

   --Competition - Both organisms are harmed by the encounter.

   --Mutualism - Both organisms benefit by the encounter.

   --Commensalism - One organism benefits, the other is not affected.

   --Predation - One organism is harmed (killed) the other benefits.

2. In the ideal parasitic relationship, the host is not killed but remains alive long enough for the parasite to reproduce and colonize a new host.

3. Two categories of parasites:
   
   A. Ectoparasites live outside the body (e.g., leeches).

   B. Endoparasites live inside the body (e.g., Plasmodium (causes malaria), Giardia, fungi, bacteria).

4. Parasites and their hosts are thought to co-evolve.
   
   A. Hosts are under selective pressure to evolve resistance to the parasite.

   B. Parasites are under selective pressure to overcome evolving host resistance.

5. Parasitic roundworms and flatworms have certain anatomical modifications:
   
   A. Degenerate (simple) body form

   B. Outer cuticle to resist being digested by host

   C. Very high fecundity, to ensure at least one offspring can colonize a new host.
6. Many parasites have complex life cycles with multiple hosts.
   A. Primary host: The one in which the parasite reproduces.
   B. Secondary host: The one in which the larval form occurs.
   C. Alternate host: An intermediate host, often between the secondary and a new primary.

7. Parasitic helminthes include flukes, tapeworms, and roundworms
   A. Affect millions of people worldwide
   B. Symptoms vary depending on the parasite involved and the degree of infection
   C. Humans often become infected by eating undercooked meat and unwashed vegetables
   D. Properly disposing of human waste is an effective means of preventing spread
   E. Parasites can be detected by looking for zygotes and parasite body parts in feces
   F. Infected people can be treated by anthelmintic drugs to expel worms
Chinese Liver Fluke
(*Opisthorchis sinensis*) - Platyhelminthes

**Symptoms:** None in mild cases; destruction of liver, bile stones and clogging of bile duct in severe cases.

**Controlled by:** 1. Properly disposing of and treating human wastes.
2. Avoiding raw fish.
Blood Flukes (Schistosomiasis)  
(Schistosoma spp.) - Platyhelminthes

Adult flukes (male and female) live in human bloodstream and mate

Female lays zygotes in capillaries of bladder or intestine

Zygotes pass into bladder or intestine

Zygotes eliminated by urination or defecation

Zygotes eaten by freshwater snail

Cercariae migrate into bloodstream and mature

Cercariae burrow into feet of swimming humans

Cercariae defecated by snail into water

Zygotes hatch to produce many cercariae

Symptoms: Enlargement of liver and spleen; bloated abdomen, wasted arms and legs, urinary disorders.

Controlled by:
1. Properly disposing of and treating human wastes.
2. Avoiding swimming in freshwater in tropics
BEEF TAPEWORM
(Taenia spp.) Platyhelminthes

Larvae activate in human intestines and mature
Humans eat raw meat
Larva migrate to cow's muscle and encysts
Eggs hatch in cow's intestine
Cow eats plants contaminated with feces
Zygotes shed with feces
Feces contaminate soil and plants
Proglottids form eggs and sperm that fuse to form zygotes
Mature tapeworm in intestines

Symptoms: Diarrhea, loss of weight and perforation of intestine

Controlled by: 1. Properly disposing of and treating human wastes
               2. Avoiding raw (rare) meat
INTESTINAL ROUNDWORM
(Ascaris spp.) - Nematoda

- Mature roundworm in intestines
- Form zygotes from eggs and sperm
- Worms travel to intestines and mature
- Small worms travel up trachea and into esophagus
- Small worms enter lungs from capillaries
- Small worms penetrate intestinal wall and enter blood vessels
- Zygotes hatch in digestive tract
- Zygotes shed with feces
- Feces contaminate soil
- Humans eat unwashed vegetables from contaminated soil
- Symptons: Diarrhea and intestinal disorders

Controlled by:
1. Properly disposing of and treating human wastes
2. Carefully washing vegetables
## MISCELLANEOUS PARASITES OF HUMANS CAUSED BY FLATWORMS AND ROUNDWORMS

<table>
<thead>
<tr>
<th>Name</th>
<th>Symptoms</th>
<th>Means of Infection</th>
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</thead>
<tbody>
<tr>
<td><strong>Platyhelminthes:</strong></td>
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<td></td>
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<tr>
<td>Swimmer's itch</td>
<td>Skin irritated after swimming in contaminated water</td>
<td>Burrowing of fluke larvae into skin</td>
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<tr>
<td>Bladder worm</td>
<td>Cysts (up to the size of an orange)</td>
<td>Infected dogs licking people's hands or faces</td>
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<tr>
<td>Pork tapeworm</td>
<td>Intestinal disorders</td>
<td>Eating raw pork</td>
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<tr>
<td>Fish tapeworm</td>
<td>Intestinal disorders</td>
<td>Eating raw fish</td>
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<tr>
<td><strong>Nematoda:</strong></td>
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<tr>
<td>Pinworm</td>
<td>Anal itching</td>
<td>Females lay zygotes around anal opening, hands transfer zygotes to mouth, infection repeats</td>
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<tr>
<td>Hookworm</td>
<td>Anemia, lethargy</td>
<td>Larvae burrow through feet from moist soil and grass contaminated by human feces</td>
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<tr>
<td>Microfilaria</td>
<td>Bloating of body parts caused by fluid retention</td>
<td>Bites from contaminated mosquitos</td>
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<td>Trichinosis</td>
<td>Muscular pain</td>
<td>Eating rare pork</td>
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