

III. Basic Principles, Chapter 2 (BLY 459, 2009)

A. ZOONOSES

1. Diseases that are naturally transferable between vertebrates and humans
2. Domestic dog carries the most zoonotic diseases
3. Examples
 - a. Dog tapeworm
 - b. Lyme disease

B. Parasite types

1. Location
 - a. Ecto- = outside/on
 - b. Endo- = inside
2. Lifestyle
 - a. OBLIGATE parasite
 - (1) At least part of lifecycle MUST be parasite for lifecycle to be completed
 - (2) There may be a free-living stage in the lifecycle
 - b. FACULTATIVE
 - (1) Organism is normally free-living
 - (2) Can be parasitic if it accidentally invades host
3. Terms
 - a. DEFINITIVE or FINAL HOST: Contains sexually reproducing (= adult) stages of parasite
 - b. INTERMEDIATE HOST
 - (1) Contains asexual stage of parasite
 - (2) Parasite may (or may not) reproduce, if reproduction occurs, it is asexual
 - c. VECTOR
 - (1) Agent of transmission
 - (2) Usually used with organisms, but inanimate agents also occur.
 - (a). Air
 - (b). Water
4. Methods of transmission
 - a. Lifecycle
 - (1). DIRECT: No intermediate host
 - (2). INDIRECT: Intermediate host required
 - b. Ecological
 - (1) HORIZONTAL TRANSMISSION
 - (a) Parasite transmitted among members of a population
 - (b) Examples
 - 1) Mosquitoes carry blood parasites between vertebrate hosts
 - 2) Vector containing infective stage is eaten by predator

Slide: Parasitology in *The Far Side*, wolves discussing trichinosis

- (2) VERTICAL TRANSMISSION
 - (a) Parasite transmitted from parent (= mother) to

- because they & their hosts live longer
 - d. Important exceptions
 - (1) Parasites not killed when intermediate hosts consumed by next host of life-cycle
 - (2) Virulent parasites such as malaria “recently” (in evolutionary time) switched to human hosts, *i.e* not well-adapted yet.
- 3. New hypothesis: Intense host exploitation occurs if negative effects on parasite (= shorter lifespan) have minor effect upon transmission
 - a. Pivotal question: Does transmission of parasite require host movement?
 - (1) If yes, then benign strains have more offspring
 - (a) Common cold virus
 - (b) Malaria in mosquitoes
 - (2) If no, parasites that reproduce fastest in host will have more offspring
 - (a) Parasites spread by insects
 - (b) Malaria in humans
 - (c) Intermediate hosts
 - b. Vertical transmission
 - (1) Host exploitation reduces survival chances of offspring of both host & parasite
 - (2) Benign parasites predicted
- 4. Experimental tests of evolutionary principles
 - a. Natural Field Experiments: Repeated appearance of drug resistant parasites
 - b. Virulence of parasitic organisms over generations is affected by lab maintenance procedures
 - (1) Artificial infection of hosts in lab (= w/o using the vector) when old lab hosts get sick results in ...
 - (a) Virulence increasing in lab hosts
 - (b) Decrease in ability of parasite to live in the vector
 - (2) If parasites are maintained *in vitro* or in hosts not encountered in the wild, parasites lose ability to infect wild-type hosts.

Slide: Development of both virulence as well as attenuation of parasite strains maintained for generations in the lab is predicted by evolutionary theory [Ebert, D. 1998, Science 282:1432-1435]