BIO 475 - Parasitology Spring 2009

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http://www4.nau.edu/isopod

Lecture 10







Figure 9.3 Longitudinal section of a mosquito intestine, with numerous oocysts (arrows) of Plasmodium sp.





- a. *Micro* and *macrogametocytes* in mosquito stomach.
 - b. *Ookinete* penetrates gut wall; forms oocyst.
- c. Sporozoites develop in cyst in 7-10 days
 - 1. Infectivity increases 10,000 x
 - 2. Often causes pathology in mosquito; invades entire body.





- d. Sporozoites enter blood in mosquito bite.
- 1. Quickly invade fixed macrophages and liver parenchyma cells.
- a. Known as "*exerythrocytic cycle*" because is not yet associated with blood.
 - 2. there undergo *schizogony* and release *merozoites*.

Malaria-Life Cycle

- 3. Some *merozoites* may remain in parenchyma cells.
- a. This is the basis for *recrudescence* of malaria.
- b. Occurs in most forms, especially *P. malariae*.
 - c. Doesn't occur in P. falciparum.

Malaria-Life Cycle

- e. Merozoites enter RBCs form a *ring stage*
 - 1. later develop into trophozoites with pigment dots (*Schuffner's dots*)
- 2. eventually divide (merogony) and become "segmenters"

because nuclei appear to segment.

3. merozoites released again





- f. Some merozoites develop into microothers into macrogametocytes
- 1. Maturation occurs; forms characteristic types.





Gametocytes (macro and micro) are ingested by mosquitoes.

- 3. Once in mosquito stomach
- a. Microgametocyte undergoes "*exflagellation*."
- 1. formation of long strings of gametes

Malaria-Life Cycle

2. Exflagellated forms are motile and penetrate macrogametocyte;

3. The life cycle continues

a. note - *definitive host* is where sex occurs.

Anopheles mosquitoes

Only about 60 species can transmit malaria and they greatly differ in their efficiency as vectors according to biting behavior, survival, fertility, breeding location.



Anopheles mosquitoes

The resting position of the adult is characteristic with the proboscis, head and abdomen in a straight line at an angle of about 45° with the resting surface.







The most efficient malaria vectors belong to the *A.gambiae* complex, widely distributed in tropical Africa, where also important is *A.funestus*.

Anopheles mosquitoes

In Asia important vectors are A.culicifaciens, A. dirus, A. sinensis and A.miminus.



Anopheles mosquitoes

In the Pacific area *A.farauti* and *A.maculatus* play a predominant role in malaria transmission.



The main vector in South America in *A*. *albimanus*.



Plasmodium vivax

5. recognizable by large ring stage in erythrocytesa. also Schuffner's dots

1. red parasitophorous vessicles

Plasmodium vivax

2. Simple, non-deadly;responsible for 43% of human malaria.
3. Common in Asia
a. Vectored by *Anopheles* mosquitoes
b. Rarely above 65° N latitude
4. Africans often have natural immunity
a. Duffy blood groups











Plasmodium malariae

Quartan malaria 1. named from cycles of 72 hours

2. cosmopolitan distribution - about 7% of human malaria

3. seems to be sister taxon of other malarias



Plasmodium malariae

Quartan malaria 1. named from cycles of 72 hours 2. cosmopolitan distribution - about 7% of human malaria 3. seems to be sister taxon of other malarias



Plasmodium malariae

- 4. recognizable by a. band form of trophs
- b. segmenters that form "daisys"
- 5. can persist for a long time
- a. relapsing fevers up to 30 years.





Thick and thin film blood smears

















Plasmodium ovale

Mild tertian malaria 1. cycles are every 48 hrs 2. tropical - rare a. Africa, SA and Asia 3. small round nucleus that disappears early 4. red Schuffners dots a. like *P. vivax*



Plasmodium ovale

Mild tertian malaria 1. cycles are every 48 hrs 2. tropical - rare a. Africa, SA and Asia 3. small round nucleus that disappears early a. 'comet' form appears 4. red Schuffners dots a. like *P. vivax*





















Plasmodium falciparum

Malignant tertian; Subtertian; Aestivoautumnal malaria 1. cycles every 48 hrs, 2. nearly cosmopolitan; now eradicated in many areas.



Plasmodium falciparum



- Characterized by knobs on erythrocytes
 multiple infection of erythrocytes
- a. causes RBCs to get sticky
- 5. Maurer's clefts like Schuffner's dots, also cause clumping.

Plasmodium falciparum

- 6. Distorted micro and macrogametocytes (*crescent shaped*).
 - 7. Ring stage and gametocytes are only circulating stages





























