

# FEMALE ANOPHELES: MALARIA AND LYMPHATIC FILARIASIS

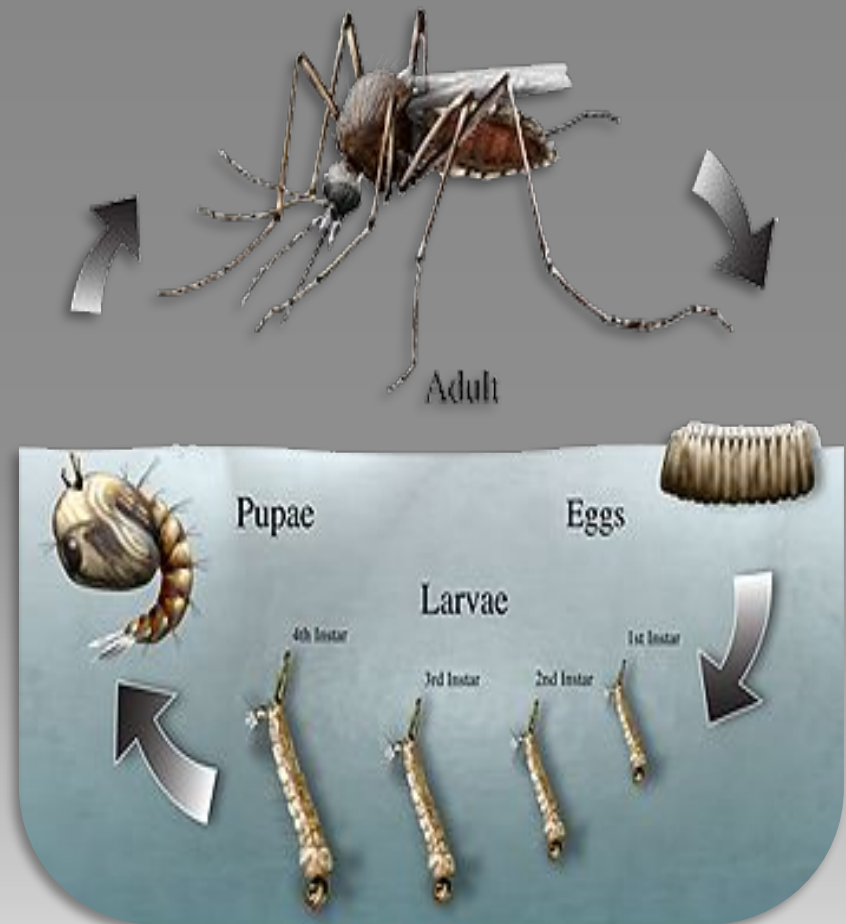
- MEDICAL ACADEMY NAMED AFTER S.I. GEORGIRVSKY
- OF VERNADSKY CFU

- DEPARTMENT OF
- MEDICAL BIOLOGY

- COURSE STUDENT  
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- SCIENTIFIC LEADER  
SVETLANA BRIGHT



- **SCIENTIFIC CLASSIFICATION**
- *Kingdom:Animalia*
- *Phylum:Arthropoda*
- *Class:Insecta*
- *Order:Diptera*
- *Family:Culicidae*
- *Subfamily:Anophelinae*
- *Genus:Anopheles*



# GENERAL MORPHOLOGY

- Mosquitoes are small (3-6 mm), two-winged insects belonging to the family Culicidae of the order Diptera (two-winged flies). They are easily distinguished from most other flies by a combination of the following characters: a long proboscis projecting forwards from the head.
- Males and females can be differentiated by the form of the antennae. In males they are very plumose, while in females they only have a few short hairs. In most others than *Anopheles* species the maxillary palps in the female are very short in contrast to the male where they are longer than the proboscis. (In both sexes of *Anopheles* the maxillary palps are long, but clubbed in the male.)



# Anopheles Mosquito

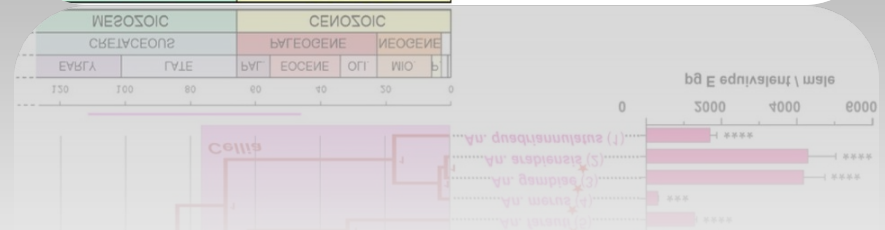
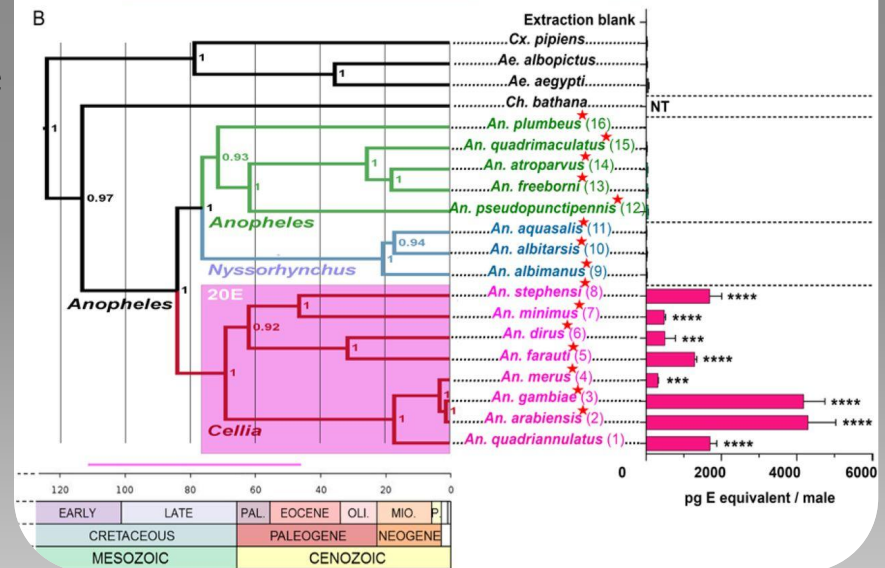
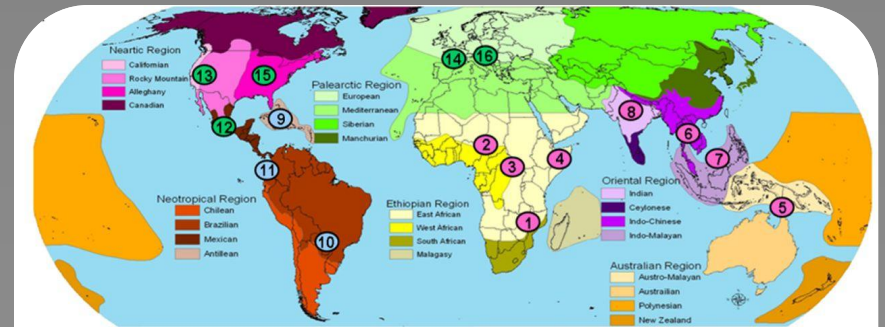
- Identification features

- Spotted wings
- When at rest, inclined at an **angle of 45\*** to the surface
- No buzzing sound

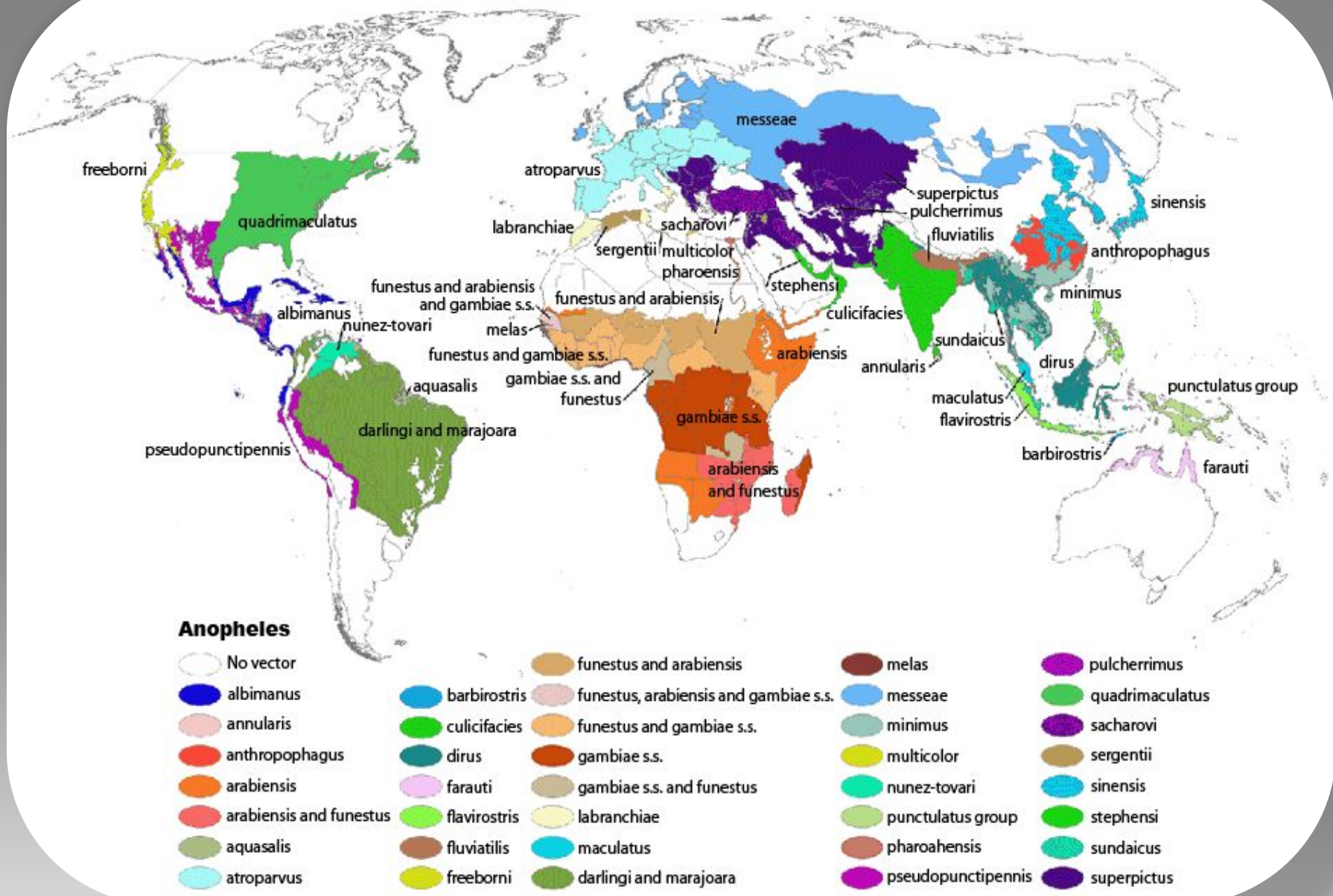


# DISTRIBUTION

- *Anopheles quadrimaculatus* mosquitoes are primarily seen in eastern North America. They are found in the eastern United States, the southern range of Canada, and parts of Mexico south to Vera Cruz. The greatest abundance occurs in the southeastern U.S. (Carpenter et al.

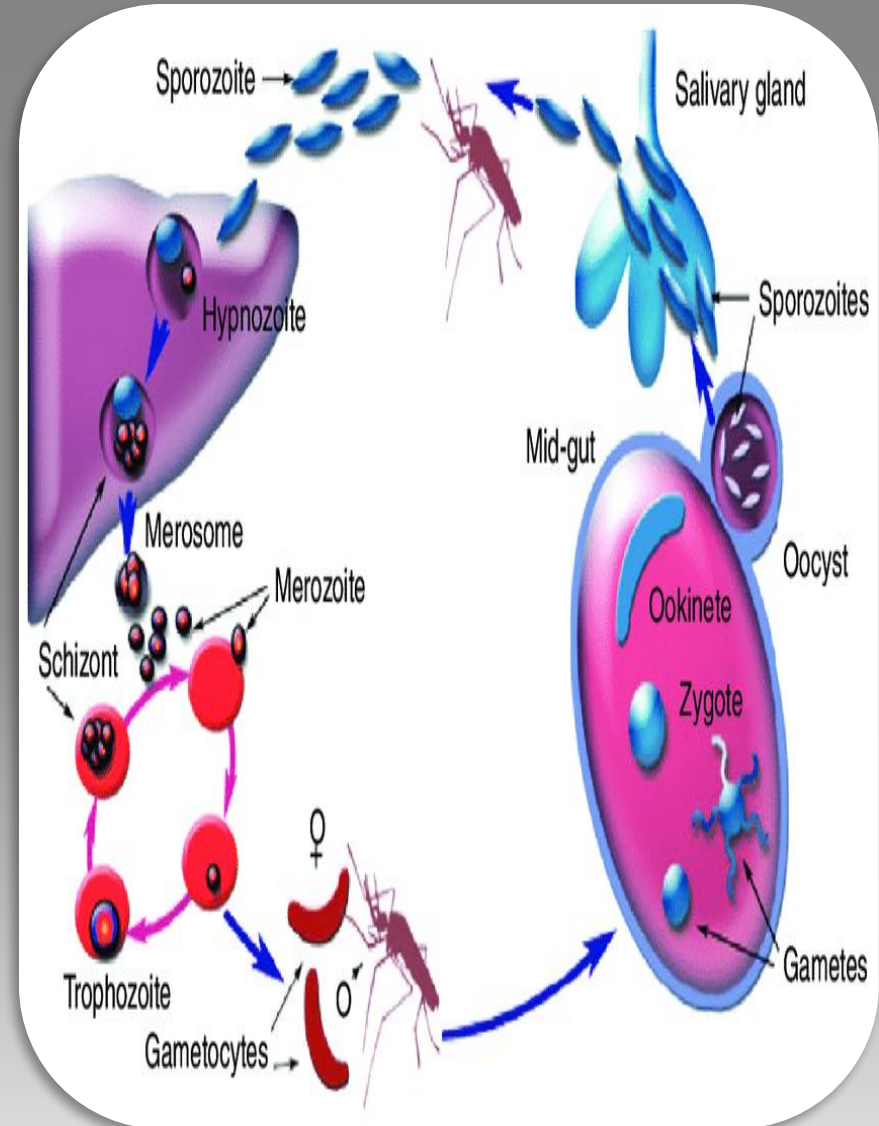




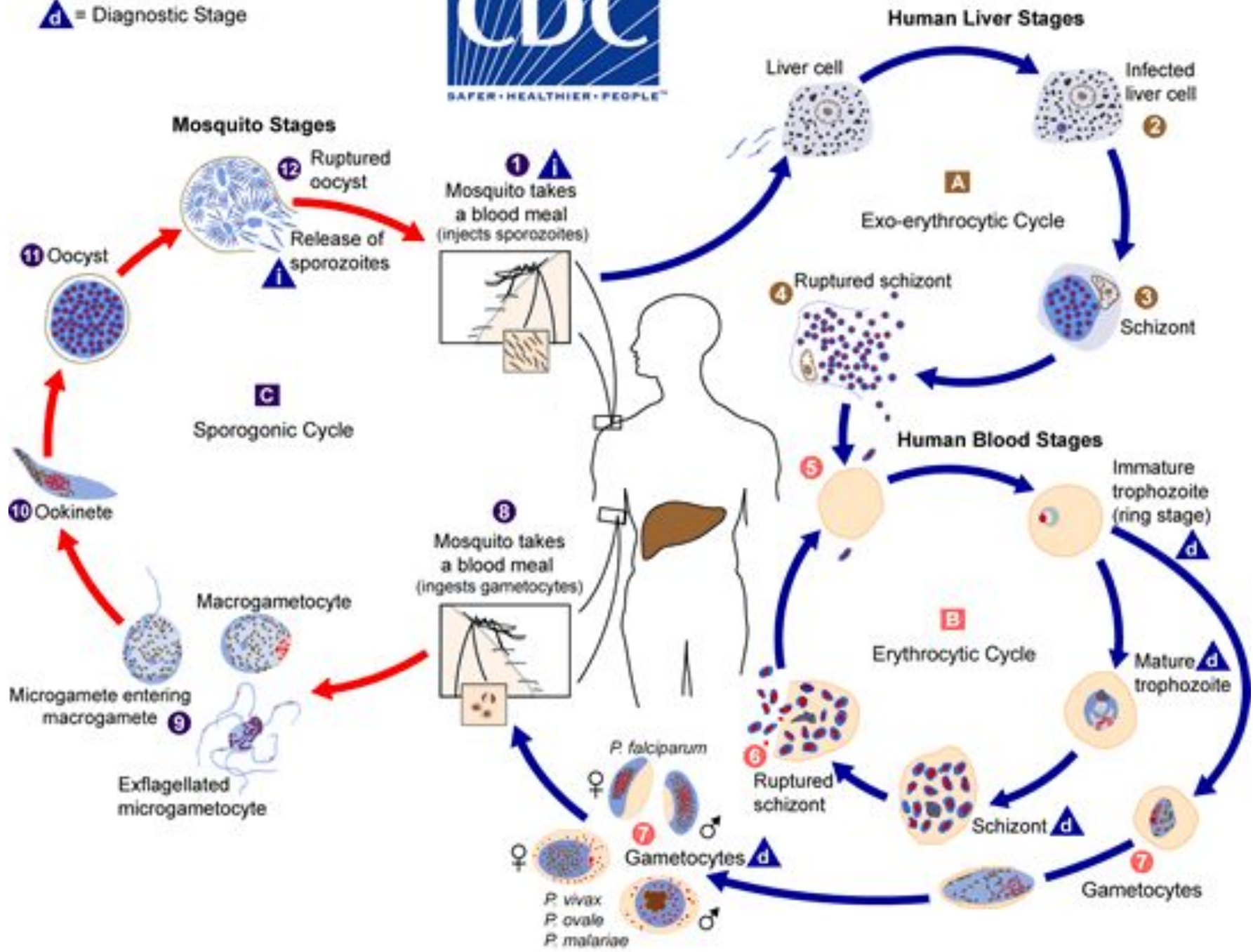


# MOSQUITO LIFECYCLE

- The natural history of malaria involves cyclical infection of humans and female *Anopheles* mosquitoes. In humans, the parasites grow and multiply first in the liver cells and then in the red cells of the blood. In the blood, successive broods of parasites grow inside the red cells and destroy them, releasing daughter parasites (“merozoites”) that continue the cycle by invading other red cells.
- The blood stage parasites are those that cause the symptoms of malaria. When certain forms of blood stage parasites (gametocytes, which occur in male and female forms) are ingested during blood feeding by a female *Anopheles* mosquito, they mate in the gut of the mosquito and begin a cycle of growth and multiplication in the mosquito. After 10-18 days, a form of the parasite called a sporozoite migrates to the mosquito’s salivary glands..

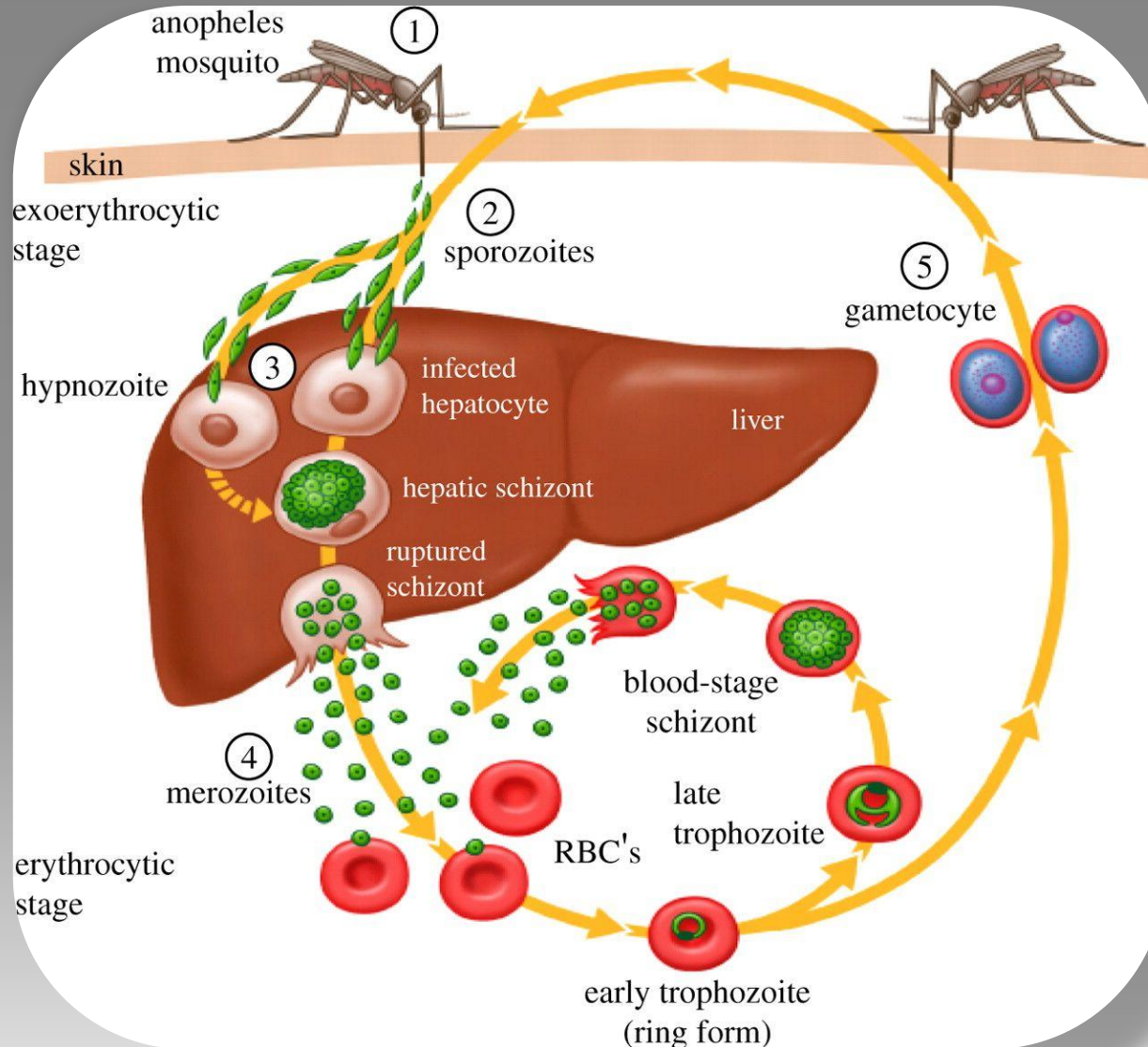


**i** = Infective Stage  
**d** = Diagnostic Stage





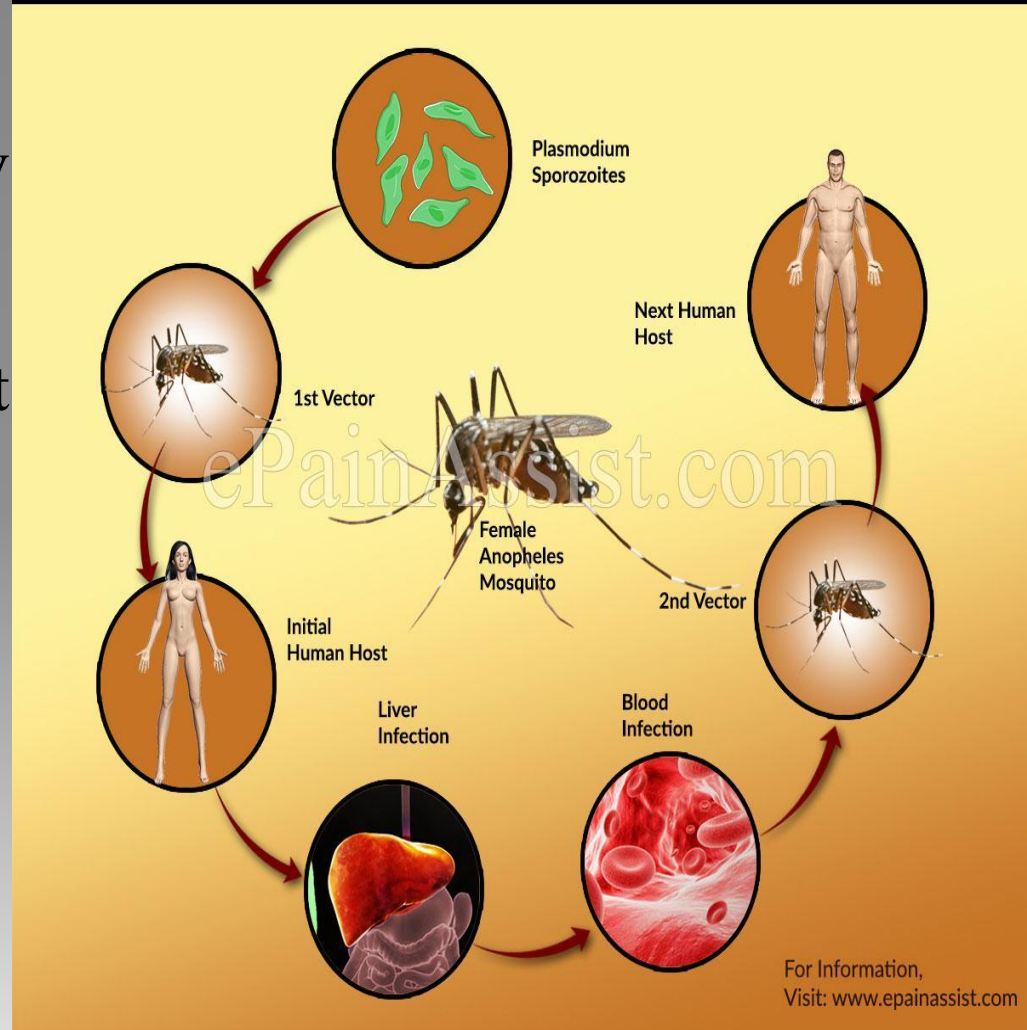
# PENETRATION



# CAUSES OF MALARIA

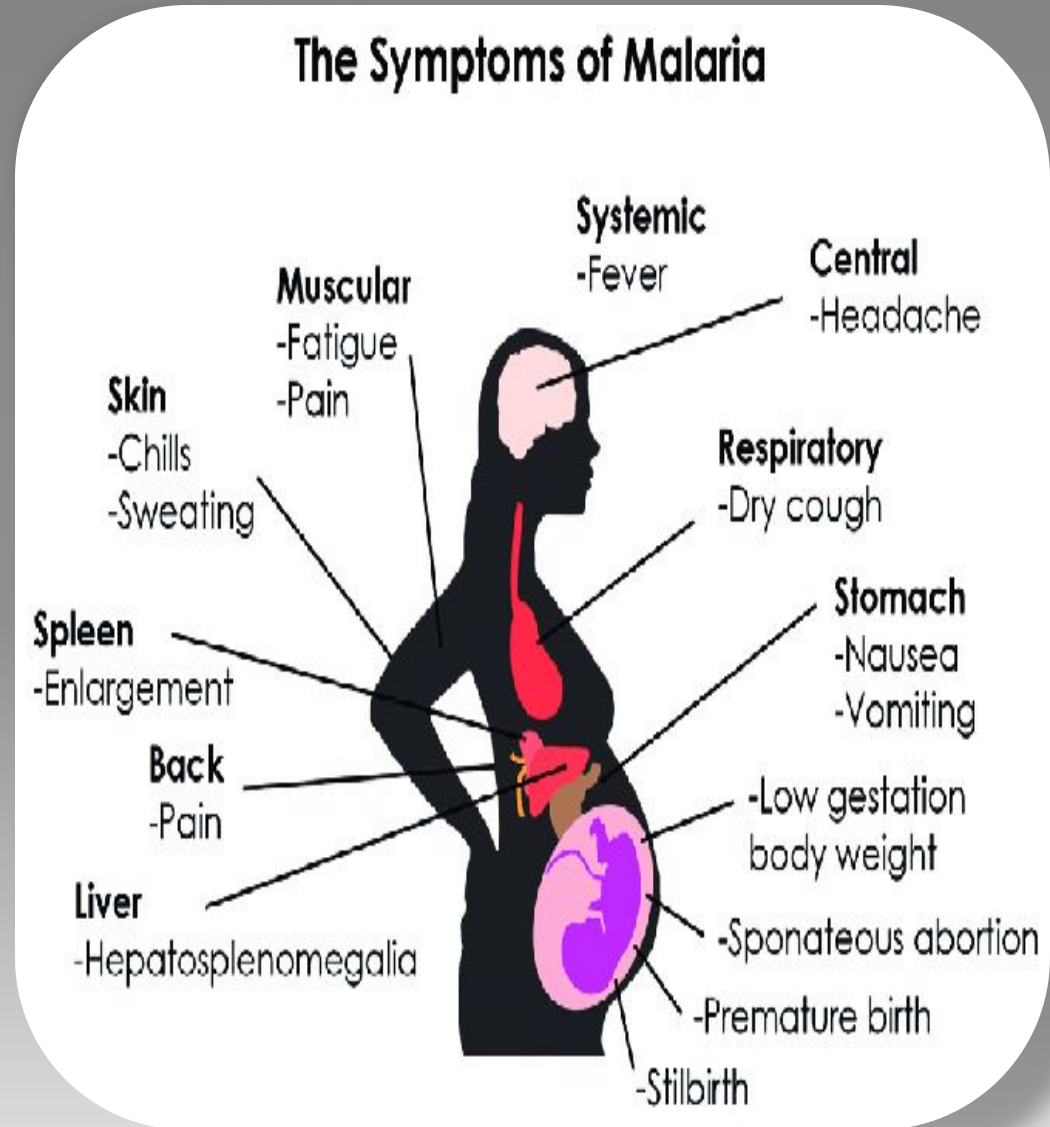
- The Plasmodium parasite is mainly spread by female Anopheles mosquitoes, which mainly bite at dusk and at night. When an infected mosquito bites a person, it passes the parasites into the bloodstream. **Malaria** can also be spread through blood transfusions and the sharing of needles, but this is very rare.

## How is this Infection Spread To Humans?



# SYMPTOMS OF MALARIA

- Shaking chills that can range from moderate to **severe**.
- high fever.
- profuse sweating.
- headache.
- nausea.
- vomiting.
- abdominal pain.
- diarrhea.



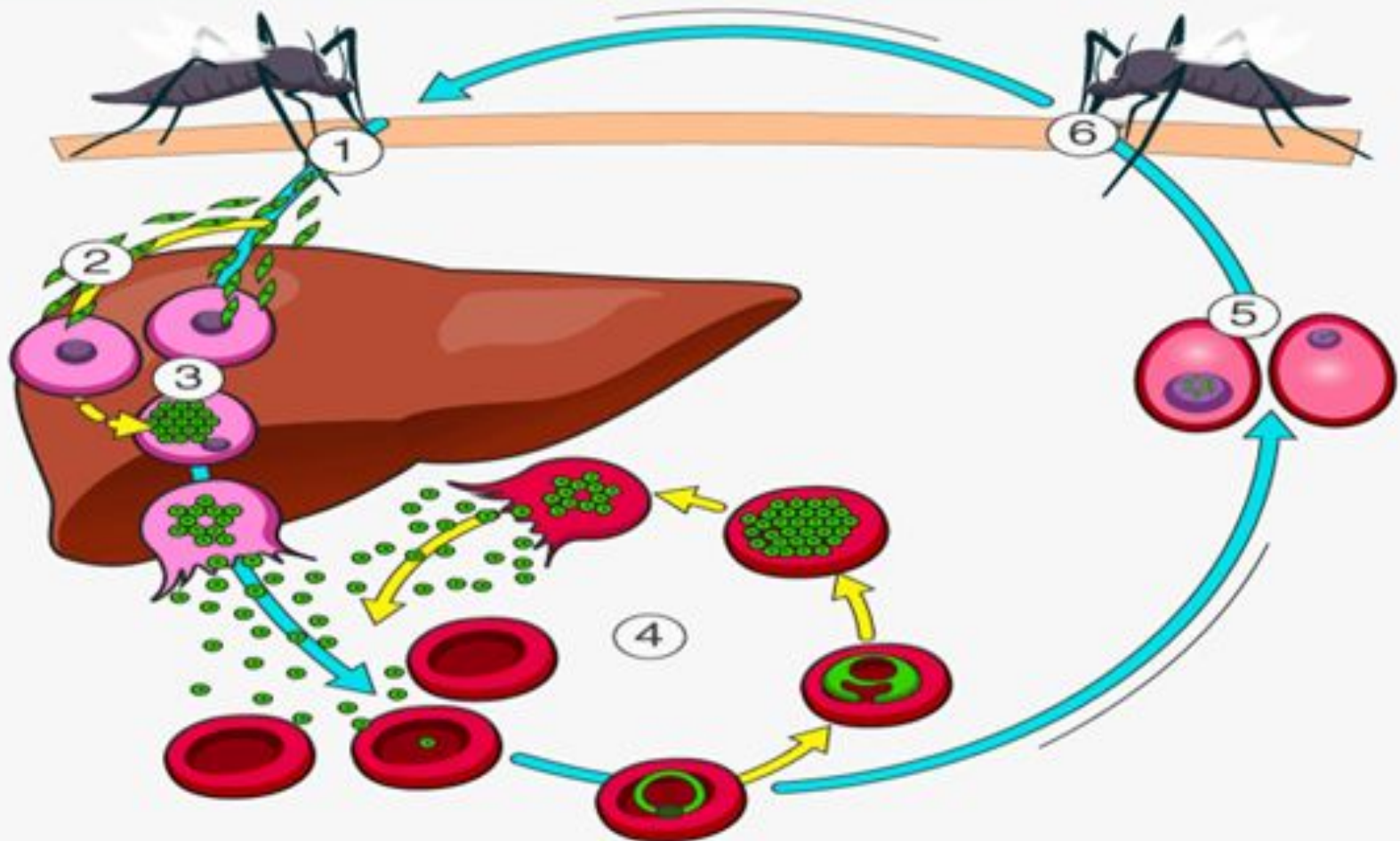
# Symptoms of Malaria Fever

- High Fever
- Sweating
- Headache
- Nausea
- Vomiting
- Diarrhea
- Anemia
- Muscle Pain
- Chills
- Fatigue





# MALARIA TRANSMISSION CYCLE



1 Transmission to human (injects sporozoites)

2 Sporozoites enter liver and infect hepatocytes

3 Liver cells rupture and merozoites released

4 Intraerythrocytic cycle

5 Sexual cycle

6 Transmission to mosquito

# TREATMENT

## Treatment of Uncomplicated *P.falciparum*

Artemisinin based combination therapies

These ACT options are Artemether plus lumefantrine, artesunate plus amodiaquine, artesunate plus mefloquine, artesunate plus sulfadoxine-pyrimethamine and dihydroartemisinin plus piperaquine.

## Treatment of *P.falciparum* in at risk groups

For pregnant women in first trimester quinine and clindamycin is advised

For pregnant women in the second and trimester, ACT's are recommended.

For lactating women, ACT's are recommended apart from dapsone, tetracyclines and primaquine.

## Treatment of uncomplicated *P.vivax* malaria

ACT's with with primaquine for chloroquine resistant infections

chloroquine 25mg base/kg body weight divided over three days taken with 0.25mg base/kg body weight of primaquine which is taken once daily for 14 days.

## Treatment of severe malaria

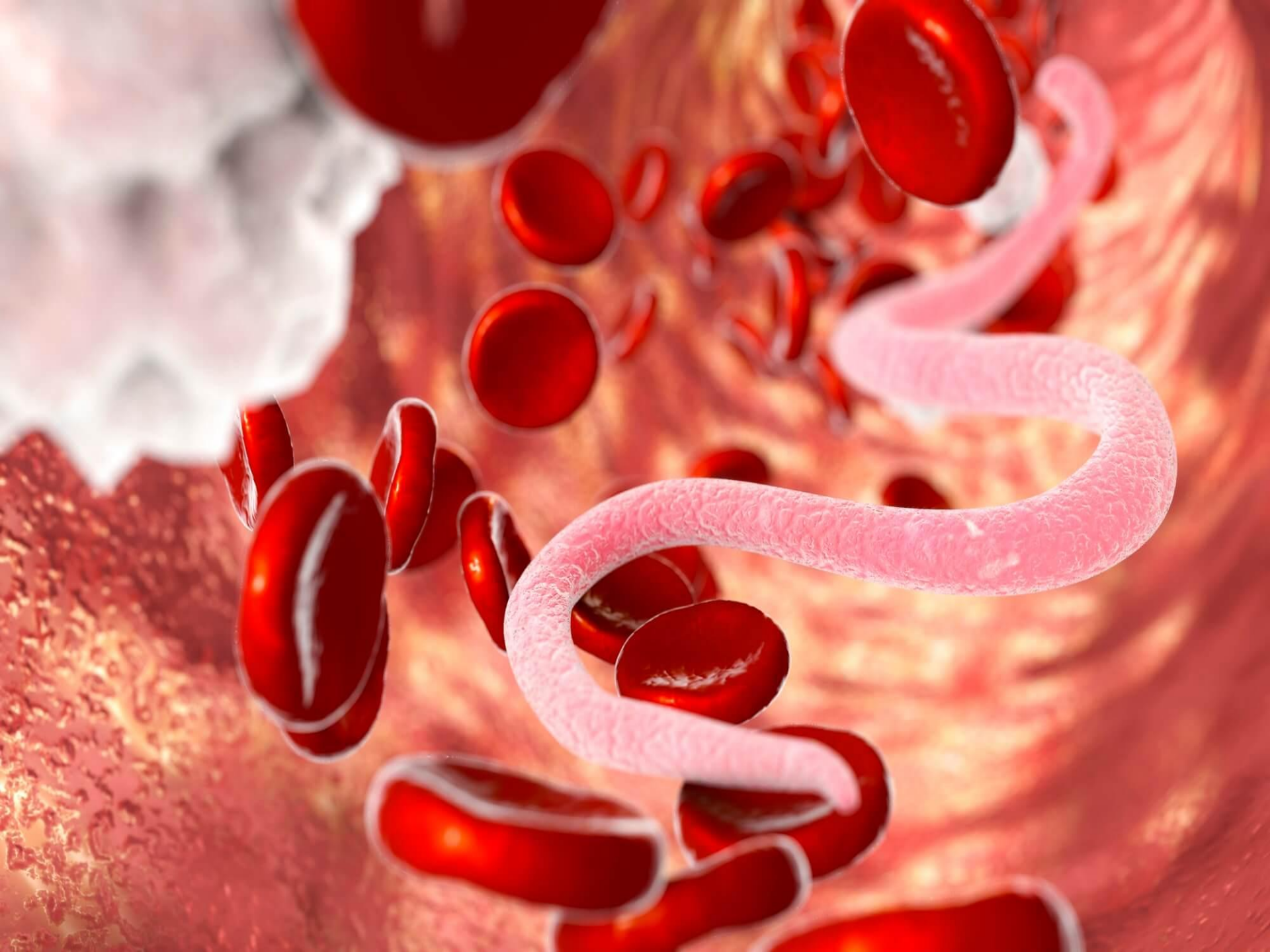
For adults, treatment with artesunate IM injection or IV infusion.

For children, Artesunate IM injection or IV infusion, Quinine or Artemether.

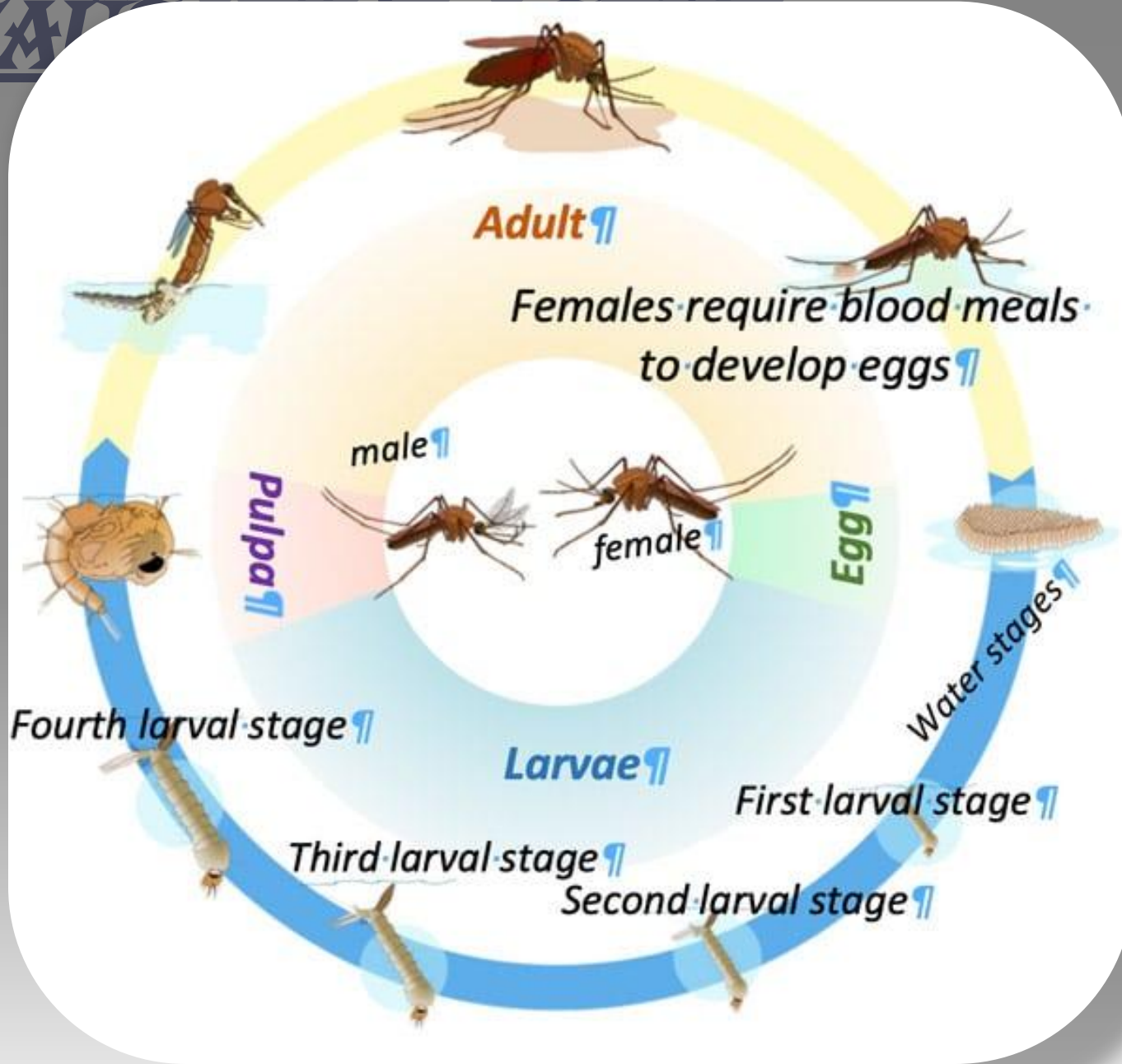


# WUCHERIA BANCROFTI









# SYMPTOMS

- *Signs*: red patches on the skin with inflammation and swelling
- *Symptoms*: fever with shivering, muscular tenderness and myalgia.
- When lymphatic filariasis develops into chronic conditions it leads to lymphoedema (tissue swelling) or elephantiasis (skin/tissue thickening) of limbs and hydrocele (scrotal swelling)



# TREATMENT



## LYMPHATIC FILARIASIS



### DISEASE

#### Infection

Filarial parasites spread by mosquitoes



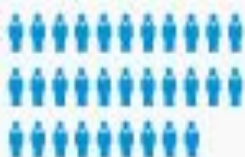
#### Disease

Impairs function of lymphatic vessels



**856** Million people

**AT RISK**



### ELIMINATION



Large-scale treatment of all at-risk populations can stop spread of infection



Vector control can supplement impact of large-scale treatment



Morbidity management & disability prevention to alleviate suffering due to disease

- **6.7 billion** treatments delivered (2000-2016)
- **499 million** people no longer require treatment
- Prevented or cured more than **97 million cases**
- **US\$ 100 billion** averted lifetime economic loss

**Lymphatic Filariasis eliminated as a public health problem in 10 countries**



# PREVENTION AND CONTROL

- The best way to prevent lymphatic filariasis is to avoid mosquito bites. The mosquitoes that carry the microscopic worms usually bite between the hours of dusk and dawn . If you live in an area with lymphatic filariasis:
- At night
  - Sleep in an air-conditioned room or
  - Sleep under a mosquito net
- Between dusk and dawn
  - Wear long sleeves and trousers and
  - Use mosquito repellent on exposed skin.





# RESOURCES

- <https://www.youtube.com/watch?v=1v55yg0RfoY>
- <https://www.youtube.com/watch?v=MxiWp8vkRFI>
- <https://www.youtube.com/watch?v=tk%20XD uPpRkLs>

Thank  
you

