FEMALE ANOPHELES: MALARIA AND LYMPHATIC FILARIASIS

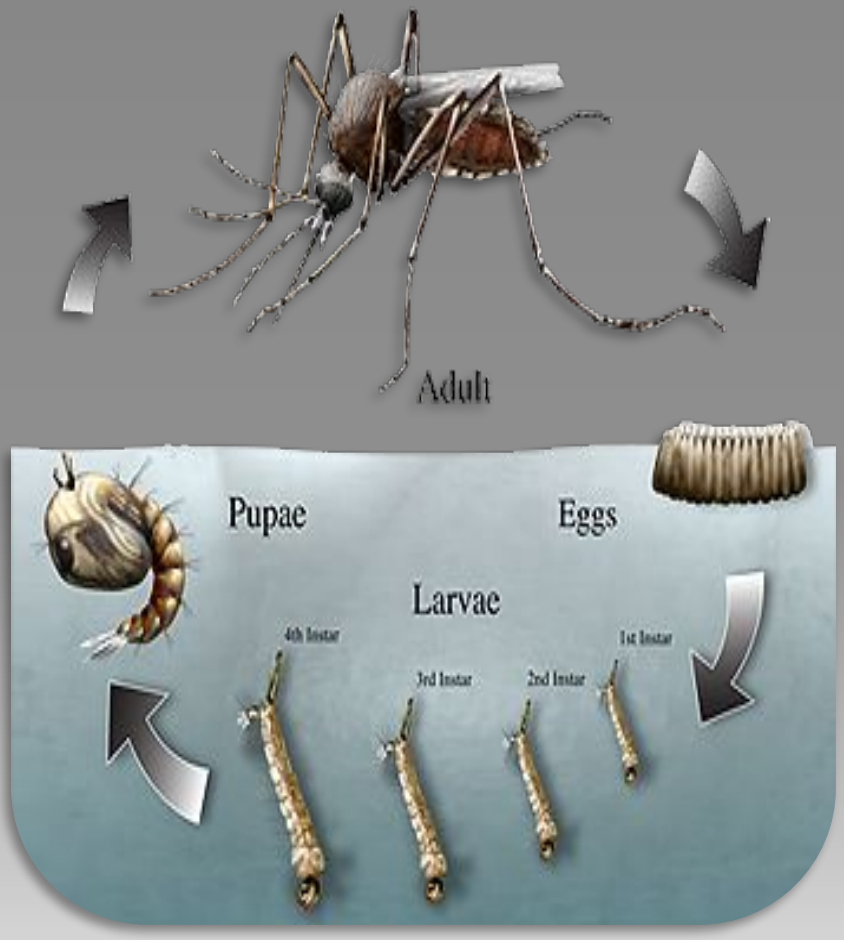
- ***MEDICAL ACADEMY NAMED AFTER S.I. GEORGIRVSKY***
- ***OF VERNADSKY CFU***

- ***DEPARTMENT OF***
- ***MEDICAL BIOLOGY***

- **COURSE STUDENT**
  SANDIP KUMAR MONDAL
- **SCIENTIFIC LEADER**
  SVETLANA BRIGHT

- **SCIENTIFIC CLASSIFICATION**

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



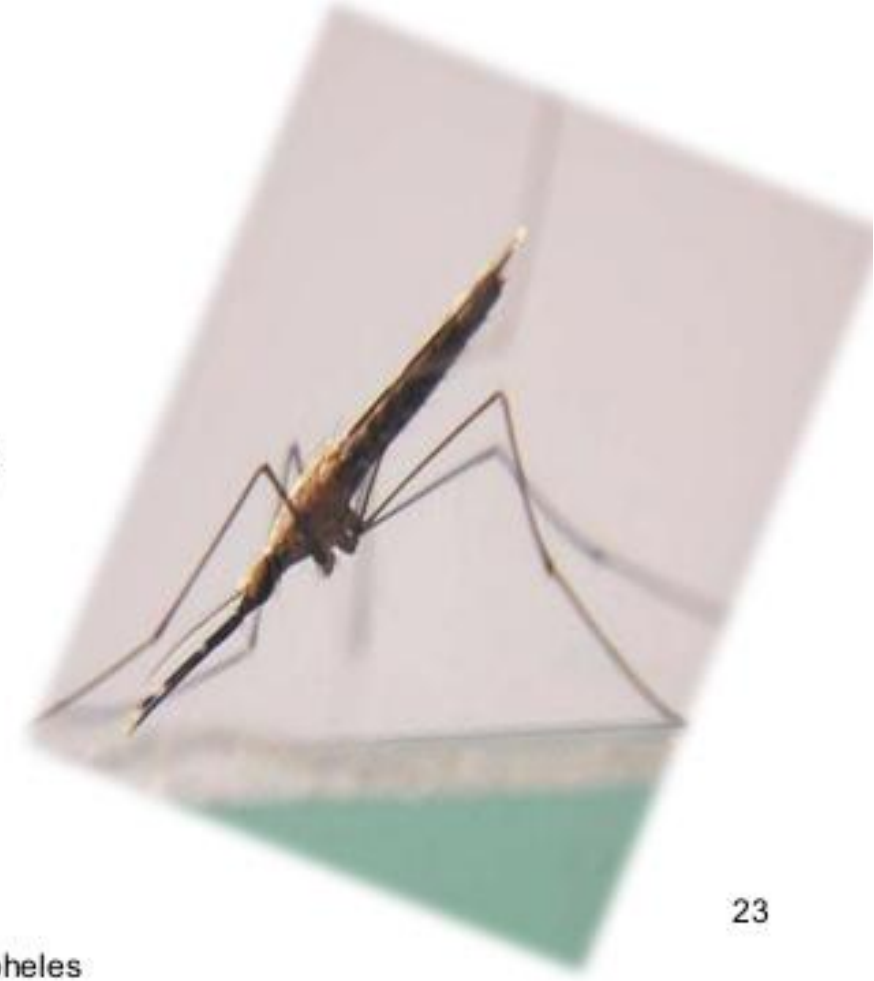
GENERAL MORPHOLOGY

- 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

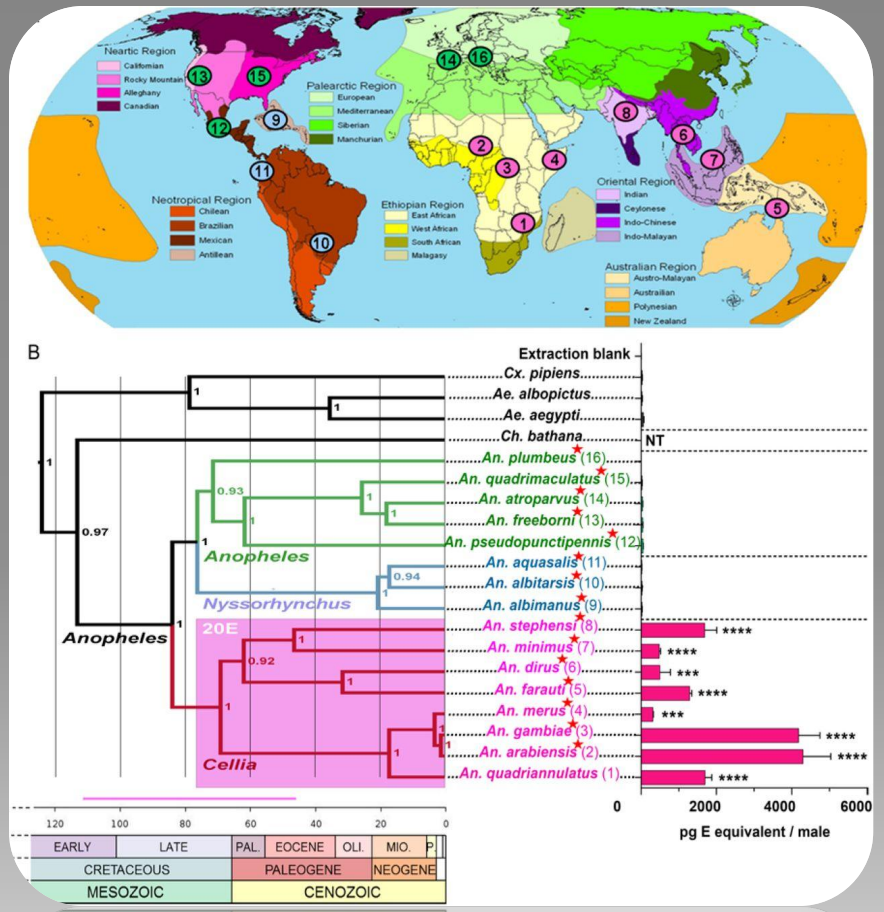
- **Identification features**

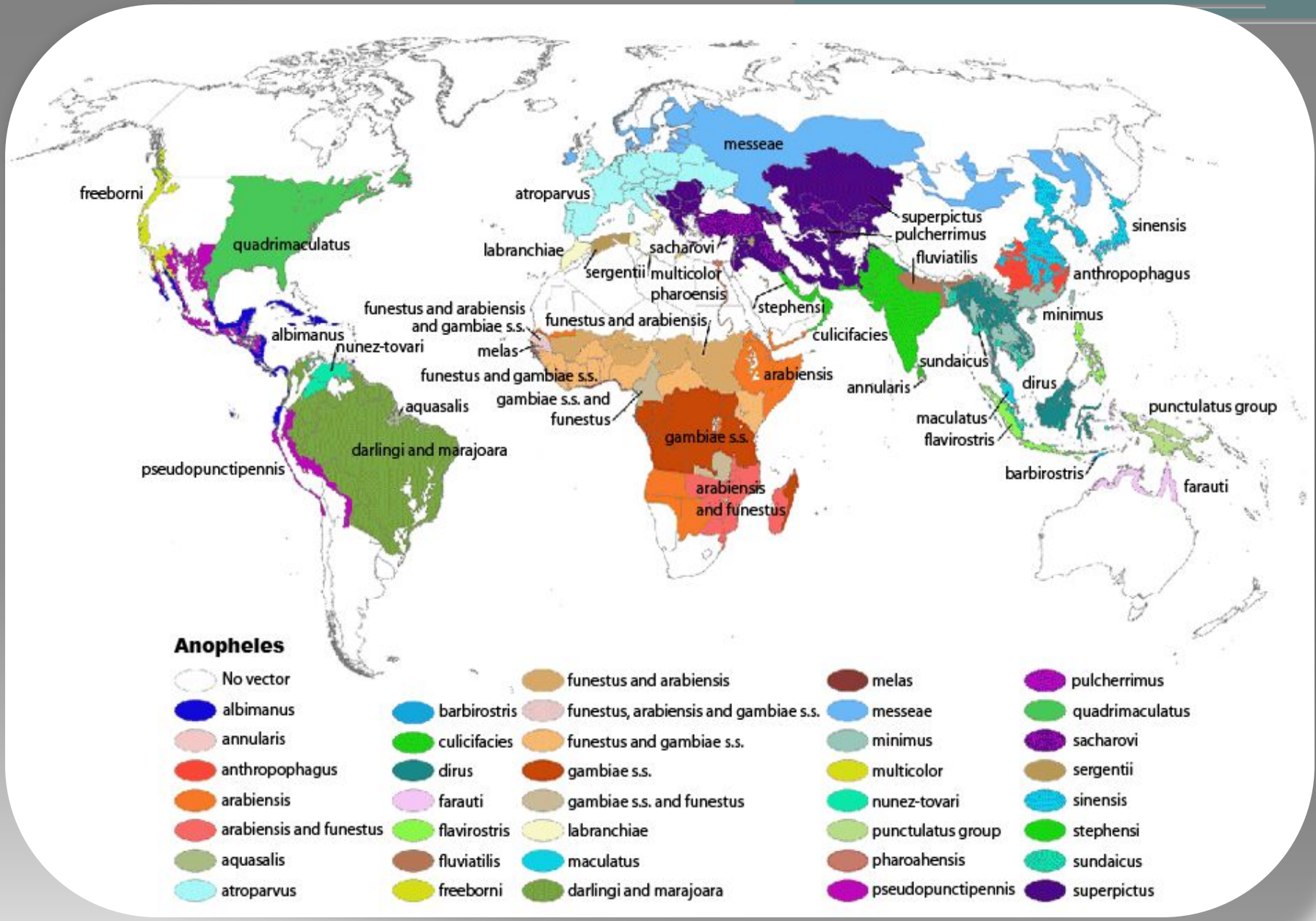
- Spotted wings
- When at rest, inclined at an **angle of 45*** to the surface
- No buzzing sound



DISTRIBUTION

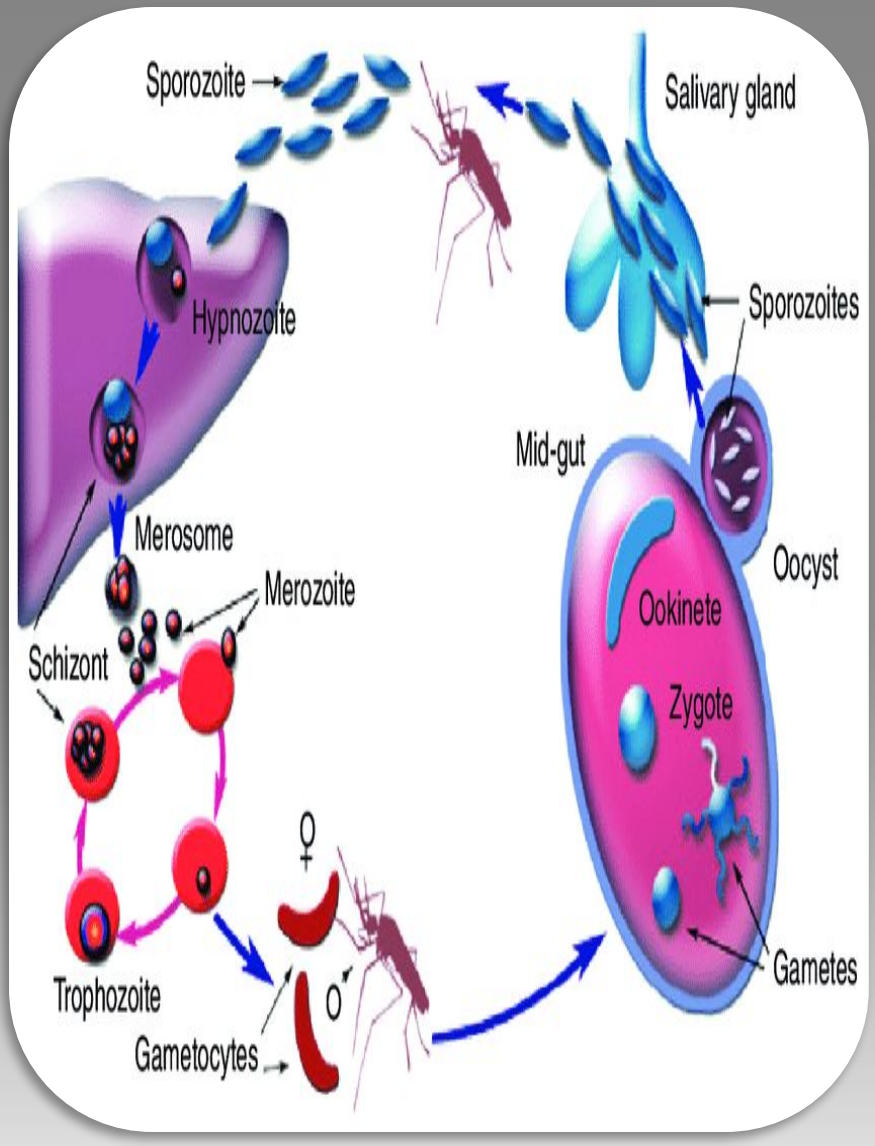
- **Anopheles** quadrimaculatus mosquitoes are primarily seen in eastern North America. They are found in the eastern United States, the southern range of Canada, and parts of Mexico south to Vera Cruz. The greatest abundance occurs in the southeastern U.S. (Carpenter et al.

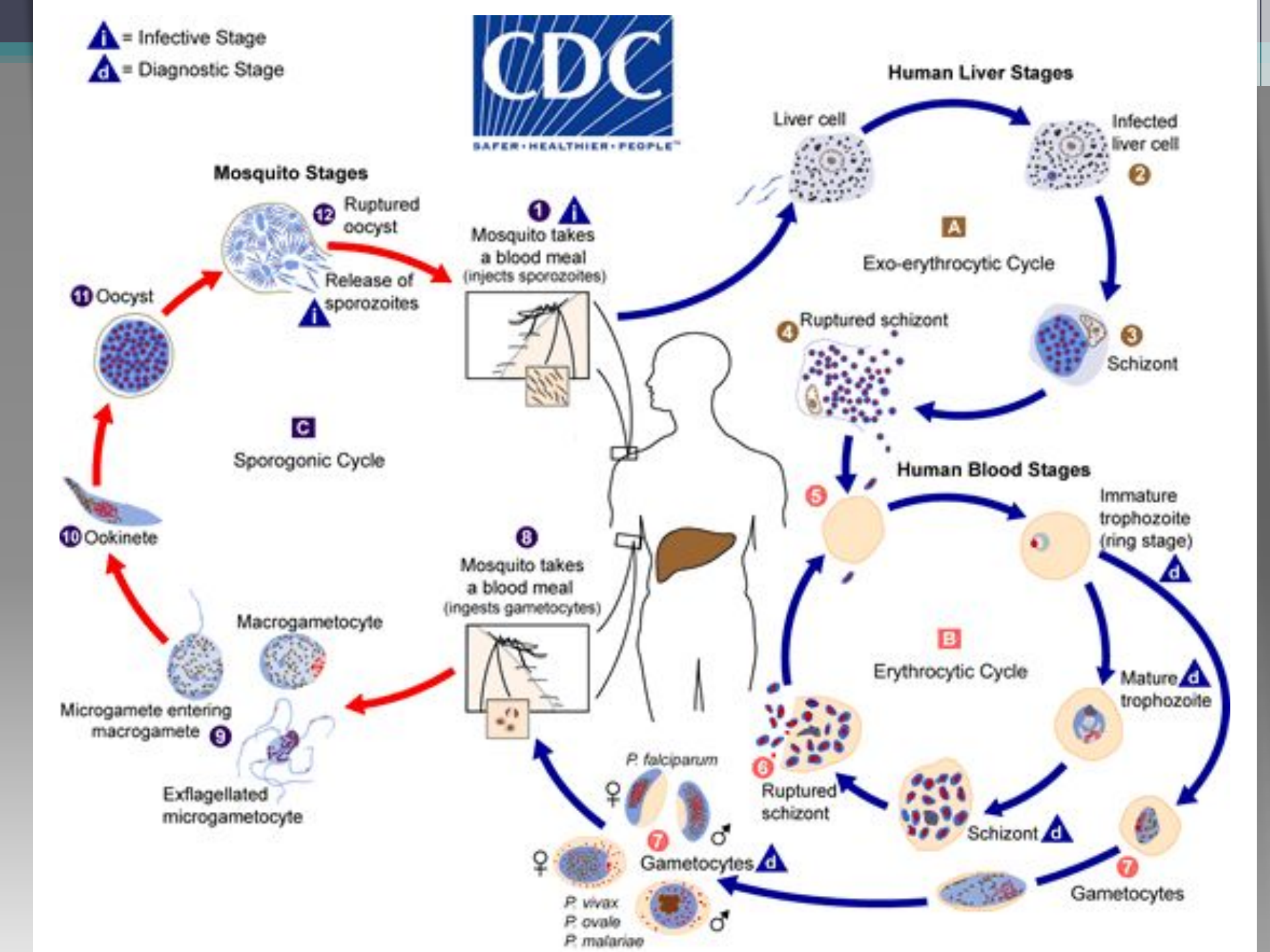



freeborni
quadrimaculatus
albimanus
nunez-tovari
pseudopunctipennis
darlingi and marajoara
aquasalis
atroparvus
messeae
labranchiae
sergentii
sacharovi
multicolor
pharoensis
superpictus
pulcherrimus
fluviatilis
sinensis
anthropophagus
stephensi
minimus
culicifacies
sundaicus
annularis
dirus
punctulatus group
maculatus
flavirostris
barbirostris
farauti
funestus and arabiensis and gambiae s.s.
melas
funestus and arabiensis
funestus and gambiae s.s.
gambiae s.s. and funestus
arabiensis
gambiae s.s.
arabiensis and funestus
Anopheles
No vector
albimanus
annularis
anthropophagus
arabiensis
arabiensis and funestus
aquasalis
atroparvus
barbirostris
culicifacies
dirus
farauti
flavirostris
fluviatilis
freeborni
funestus and arabiensis
funestus, arabiensis and gambiae s.s.
funestus and gambiae s.s.
gambiae s.s.
gambiae s.s. and funestus
labranchiae
maculatus
darlingi and marajoara
melas
messeae
minimus
multicolor
nunez-tovari
punctulatus group
pharoahensis
pseudopunctipennis
pulcherrimus
quadrimaculatus
sacharovi
sergentii
sinensis
stephensi
sundaicus
superpictus

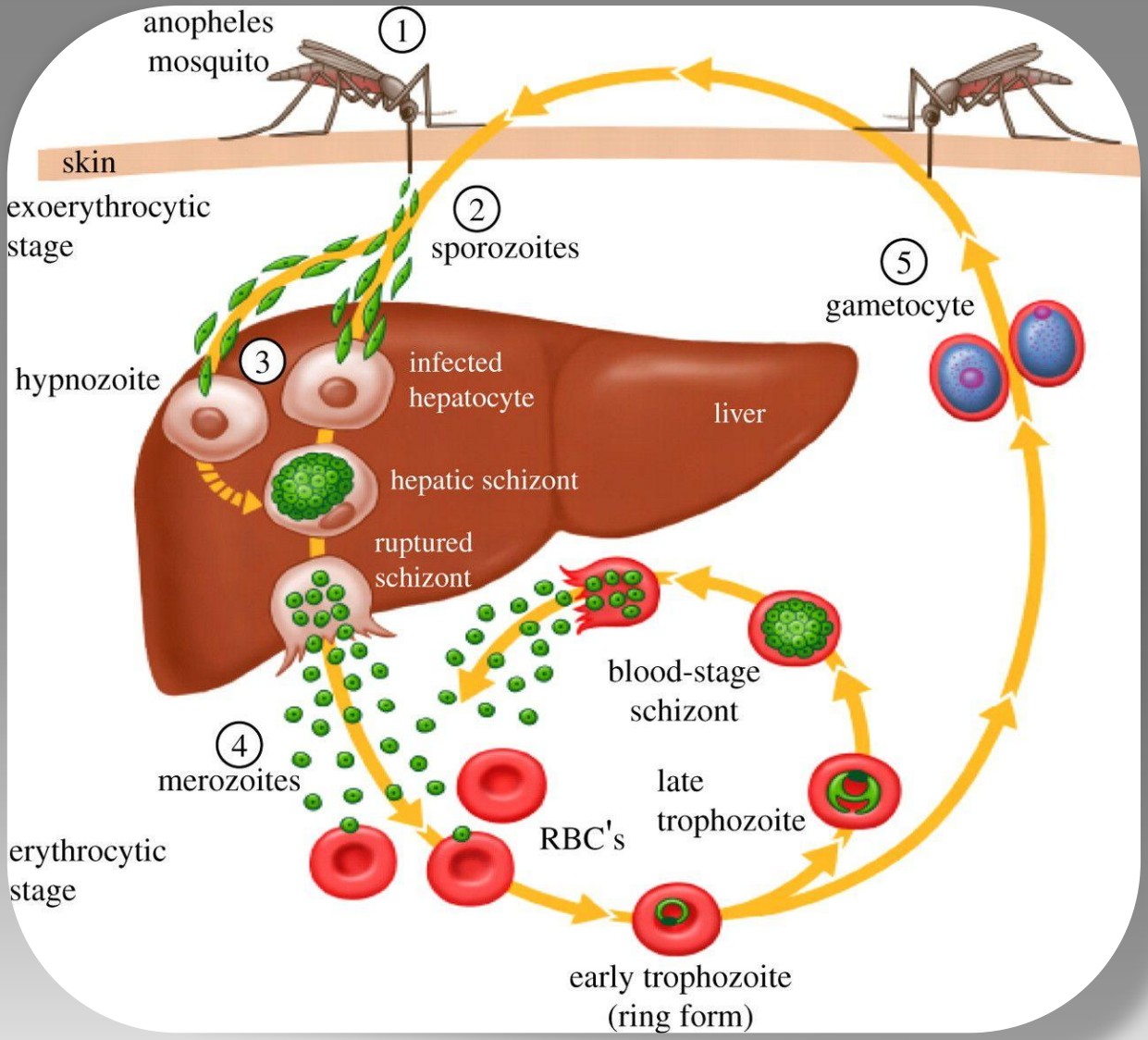
MOSQUITO LIFECYCLE

- 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..



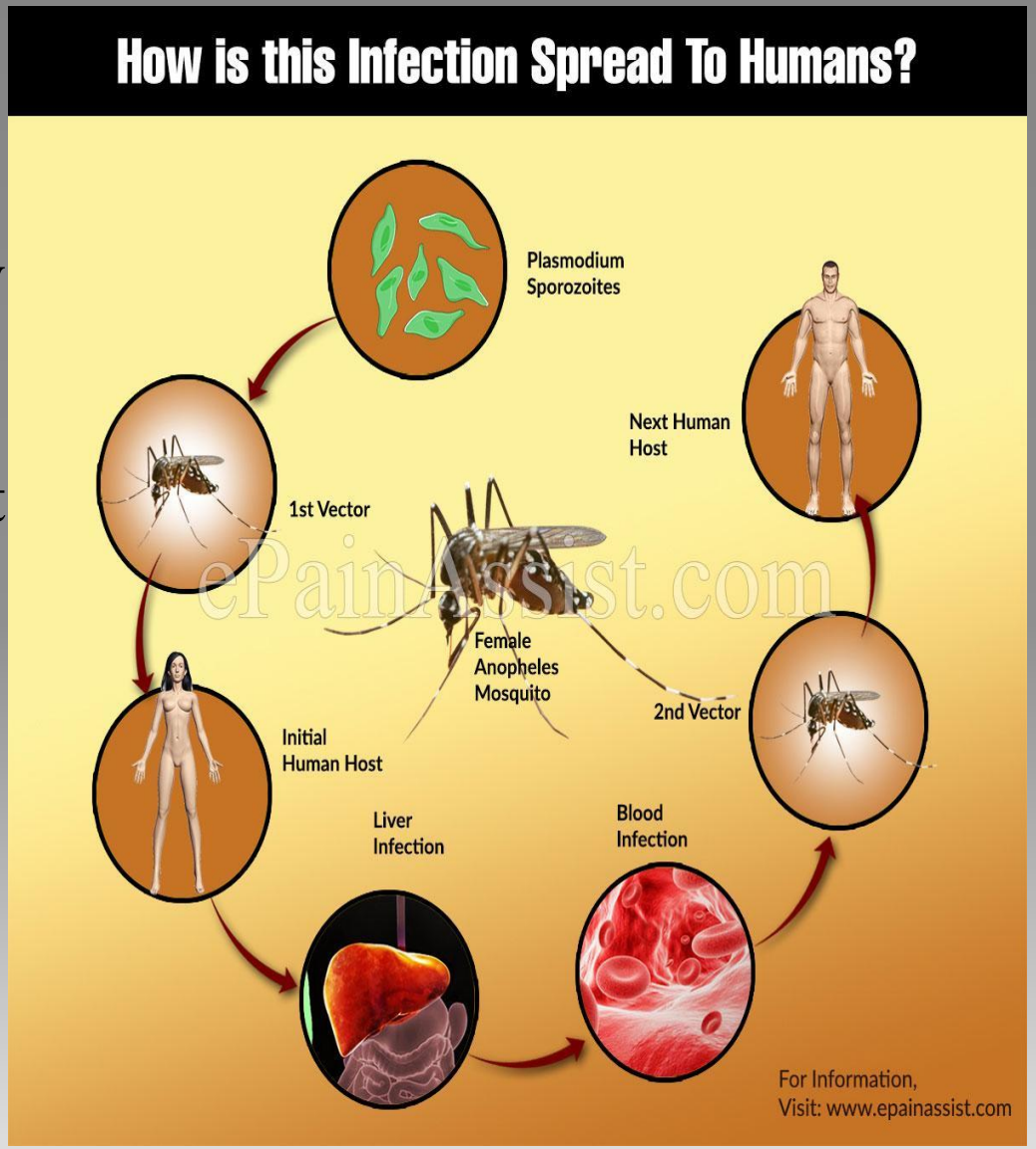

i = Infective Stage
d = Diagnostic Stage
CDC
SAFER · HEALTHIER · PEOPLE™
Human Liver Stages
Liver cell
Infected liver cell
2
A
Exo-erythrocytic Cycle
3
Schizont
4
Ruptured schizont
Human Blood Stages
5
Immature trophozoite (ring stage)
d
Mature trophozoite
d
B
Erythrocytic Cycle
6
Ruptured schizont
Schizont
d
7
Gametocytes
d
P. falciparum
P. vivax
P. ovale
P. malariae
Gametocytes
8
Mosquito takes a blood meal
(ingests gametocytes)
Macrogametocyte
Microgamete entering macrogamete
9
Exflagellated microgametocyte
10
Ookinete
11
Oocyst
12
Ruptured oocyst
Release of sporozoites
Mosquito Stages
1
Mosquito takes a blood meal
(injects sporozoites)
C
Sporogonic Cycle

PENETRATION



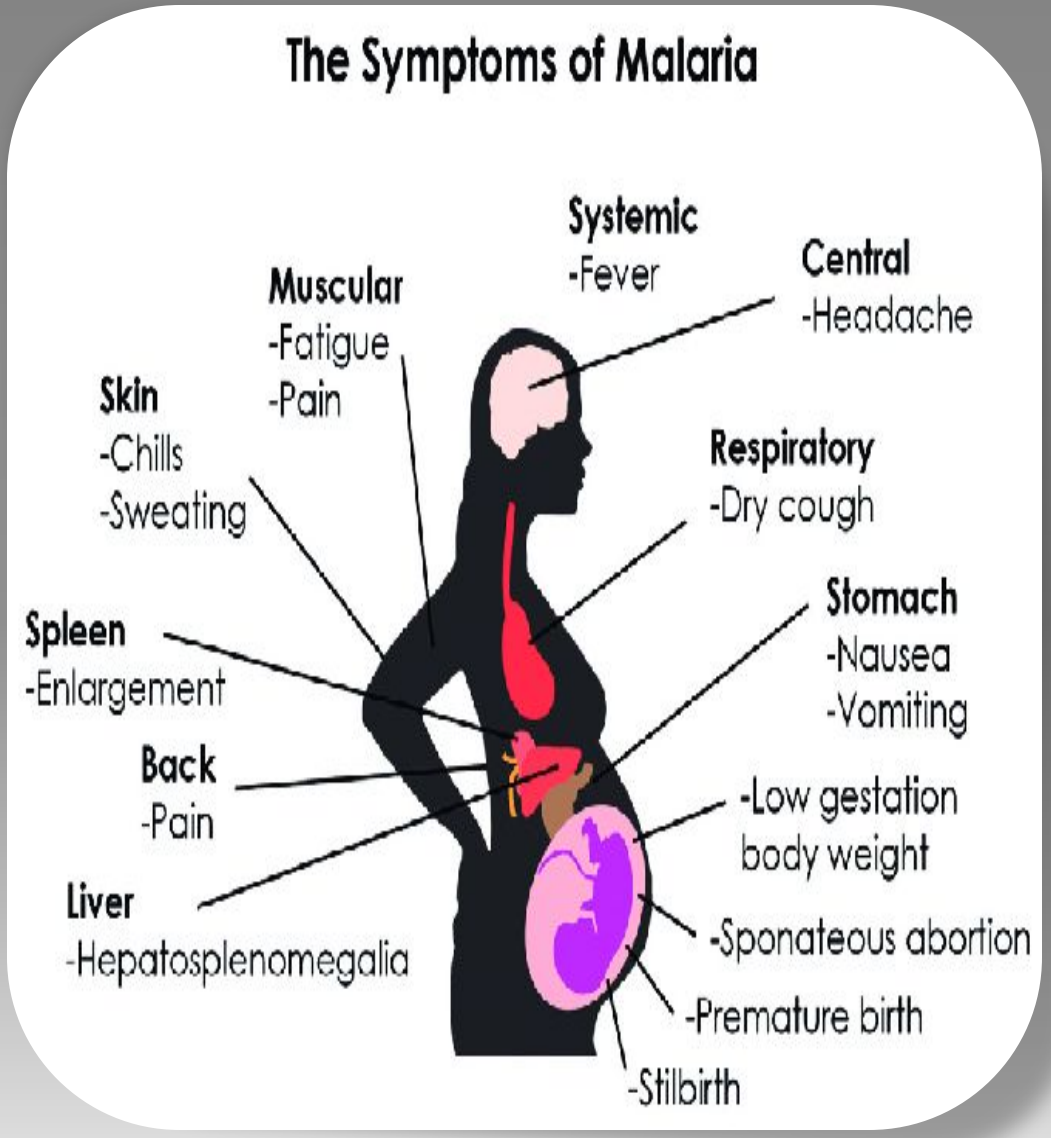
CAUSES OF MALARIA

- 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.



SYMPTOMS OF MALARIA

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

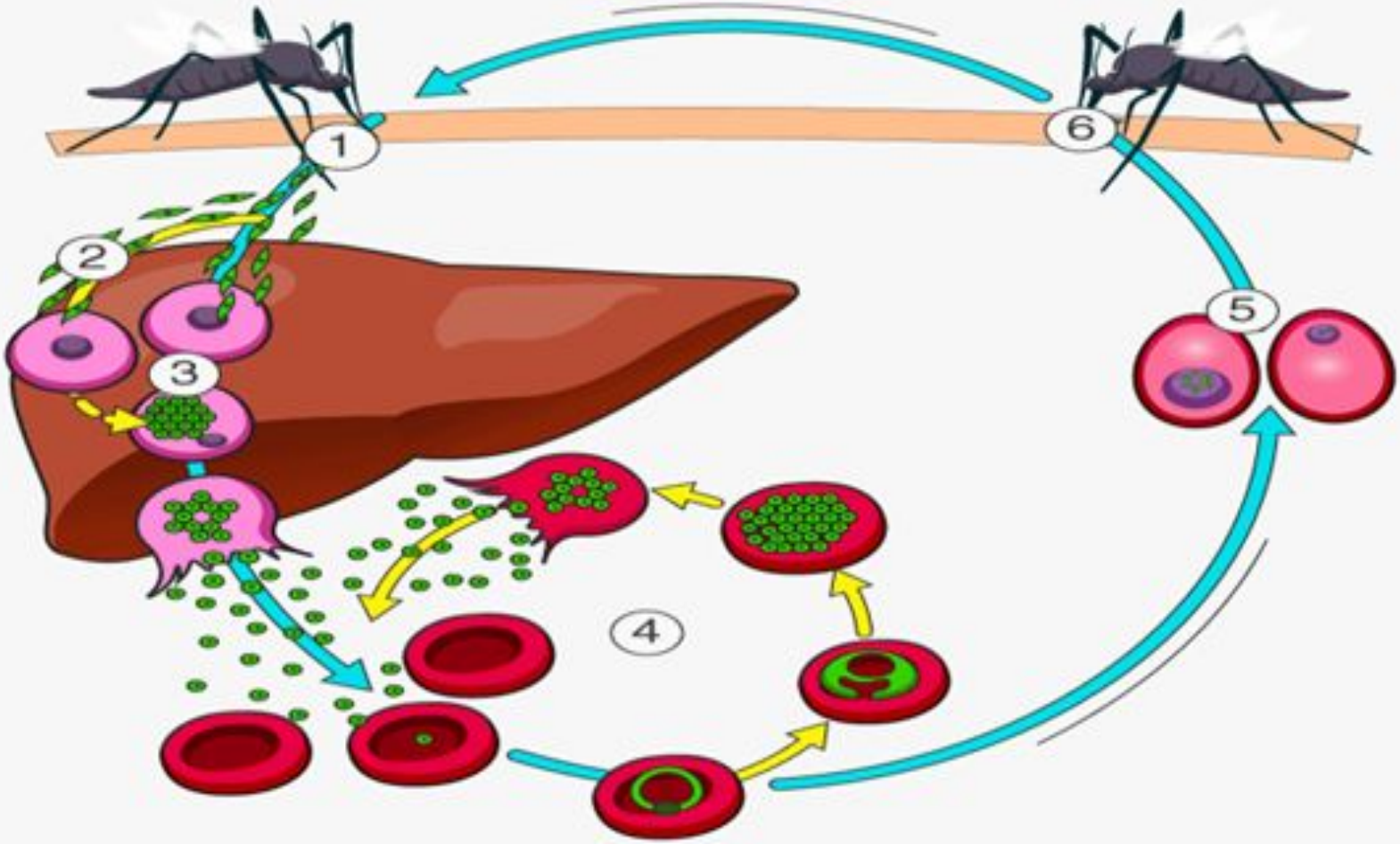


ConnectnCare

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 Artemther plus lumefantrine, artesunate plus amodiaquine, artesunate plus mefloquine, artesunate plus sulfadoxine-pyrimethamine and dihydroartemisin plus piperaquine.

Treatment of P.falciprum in at risk groups

- For pregnant women in first trimester quinine and clindamycin is adviced
- For pregnant woment in the second and trimester, ACT's are reccomended.
- For lactating women, ACT's are reccomended apart from dapsone, tetracyclines and primaquine.

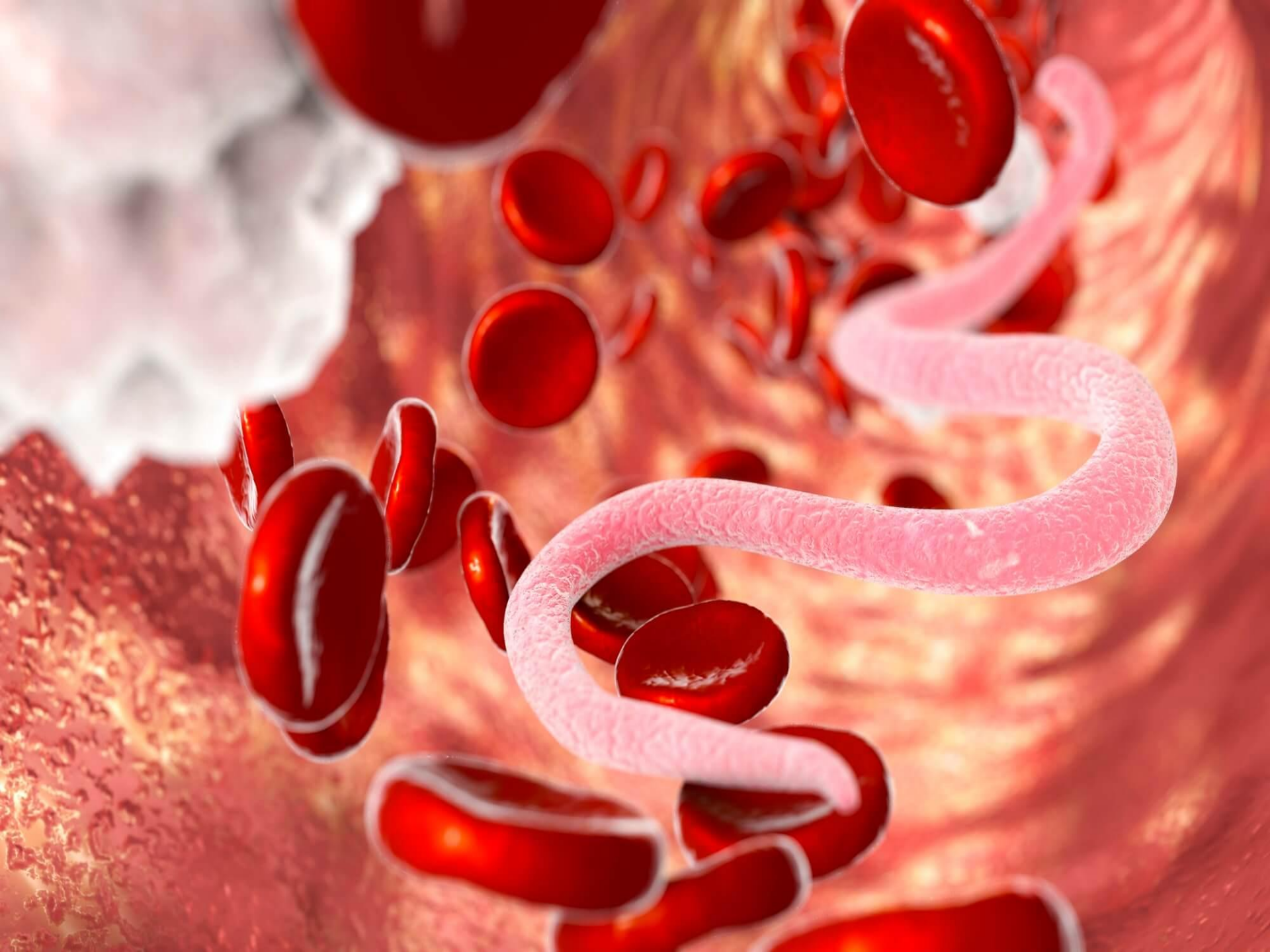
Treatment of uncomplicated P.vivax malaria

- 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.

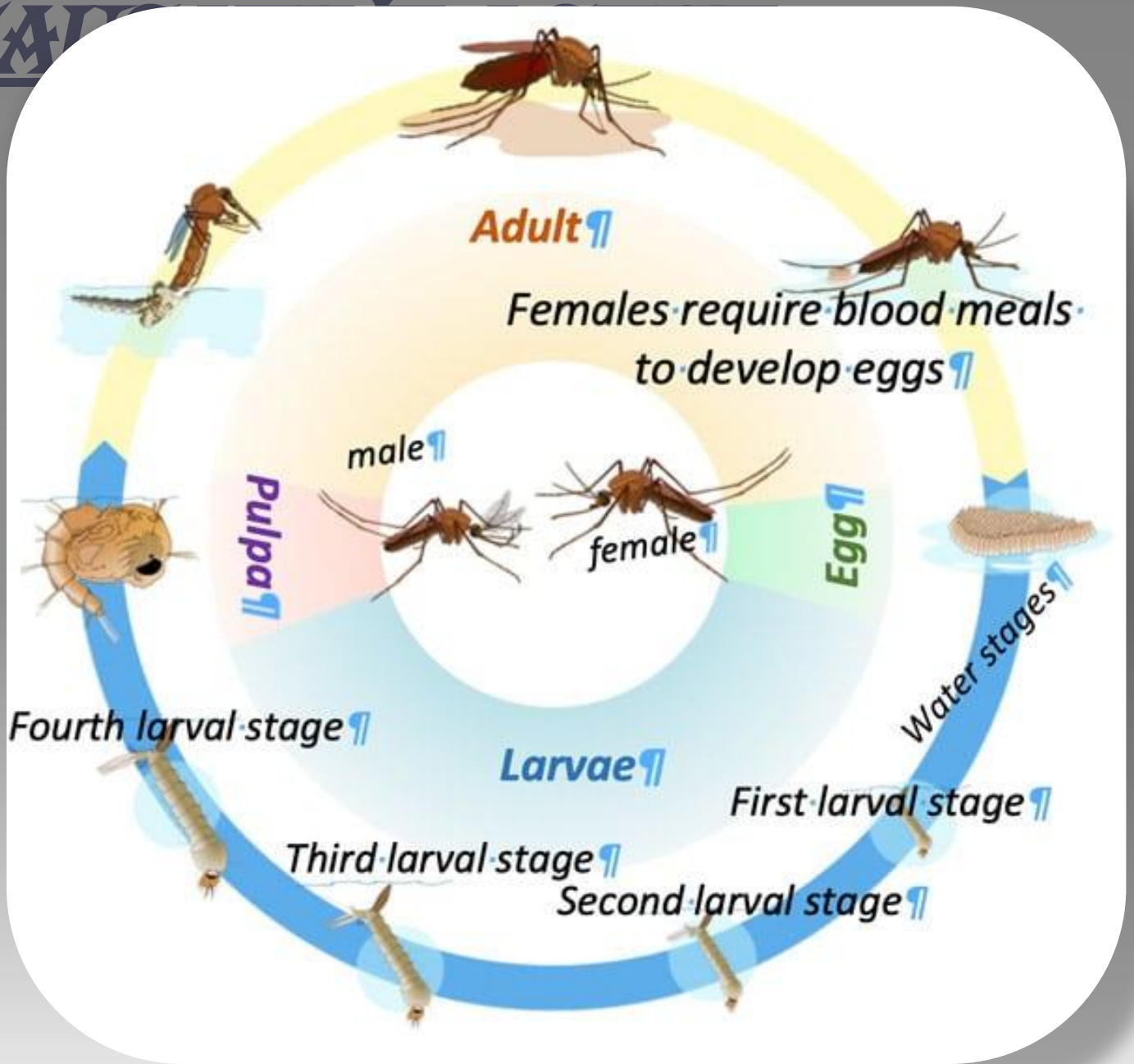
Treatment of severe malaria

- For adults, treatment with artesunate IM injection or IV infusion.
- For children, Artesunate IM injection or IV infusion, Quinine or Artemether.

WUCHERIA BANCROFTI



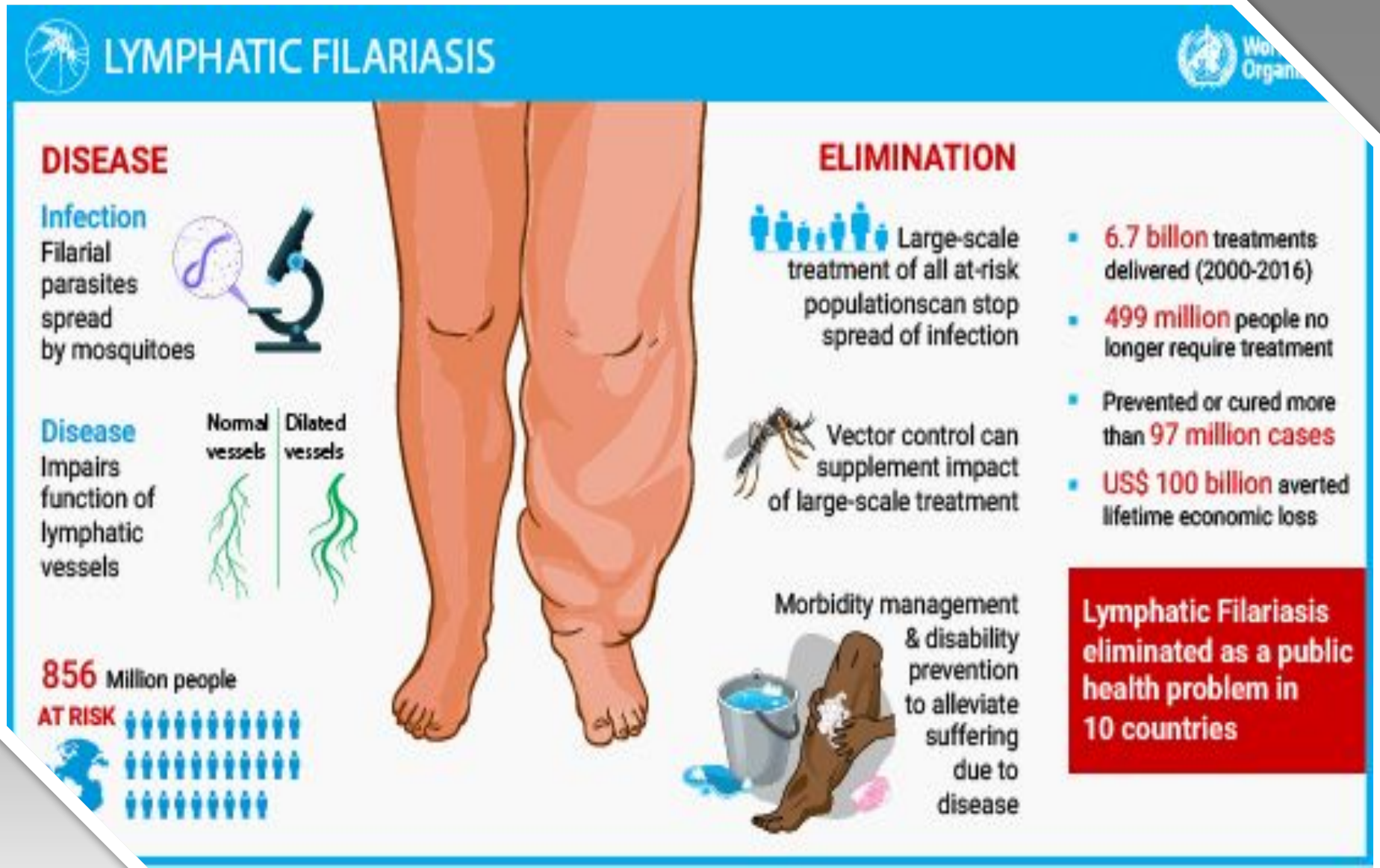
CA


Adult
Females require blood meals to develop eggs
male
female
Pupa
Egg
Water stages
Fourth larval stage
Larvae
First larval stage
Third larval stage
Second larval stage

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
Normal vessels
Dilated vessels
856 Million people
AT RISK
ELIMINATION
Large-scale treatment of all at-risk populationscan 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 billon 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%20XDuPpRkLs


Thank you