MALARIA

BY DR WAJEEHA RAHMAN

LEARNING GOALS

- To know the vector causing malaria and the different types.
- Life cycle of plasmodium.
- Signs /symptoms
- Diagnostic methods
- Complications
- Pathogenesis
- Preventive measures

- Malaria is a serious and sometimes fatal disease caused by a parasite that commonly infects a certain type of mosquito which feeds on humans. People who get malaria are typically very sick with high fevers, shaking chills, and flu-like illness.
- Four kinds of malaria parasites infect humans: Plasmodium falciparum, P. vivax, P. ovale, and P. malariae.

- P. falciparum is the type of malaria that is most likely to result in severe infections and if not promptly treated, may lead to death. Although malaria can be a deadly disease, illness and death from malaria can usually be prevented.

- Usually, people get malaria by being bitten by an infective female Anopheles mosquito. Only Anopheles mosquitoes can transmit malaria and they must have been infected through a previous blood meal taken from an infected person. When a mosquito bites an infected person, a small amount of blood is taken in which contains microscopic malaria parasites.

- Because the malaria parasite is found in red blood cells of an infected person, malaria can also be transmitted through blood transfusion, organ transplant, or the shared use of needles or syringes contaminated with blood. Malaria may also be transmitted from a mother to her unborn infant before or during delivery (“congenital” malaria).

- Plasmodium falciparum is the type of malaria that most often causes severe and life-threatening malaria; this parasite is very common in many countries in Africa south of the Sahara desert. People who are heavily exposed to the bites of mosquitoes infected with P. falciparum are most at risk of dying from malaria. People who have little or no immunity to malaria, such as young children and pregnant women or travelers coming from areas with no malaria, are more likely to become very sick and die.

SYMPTOMS OF MALARIA

Headache

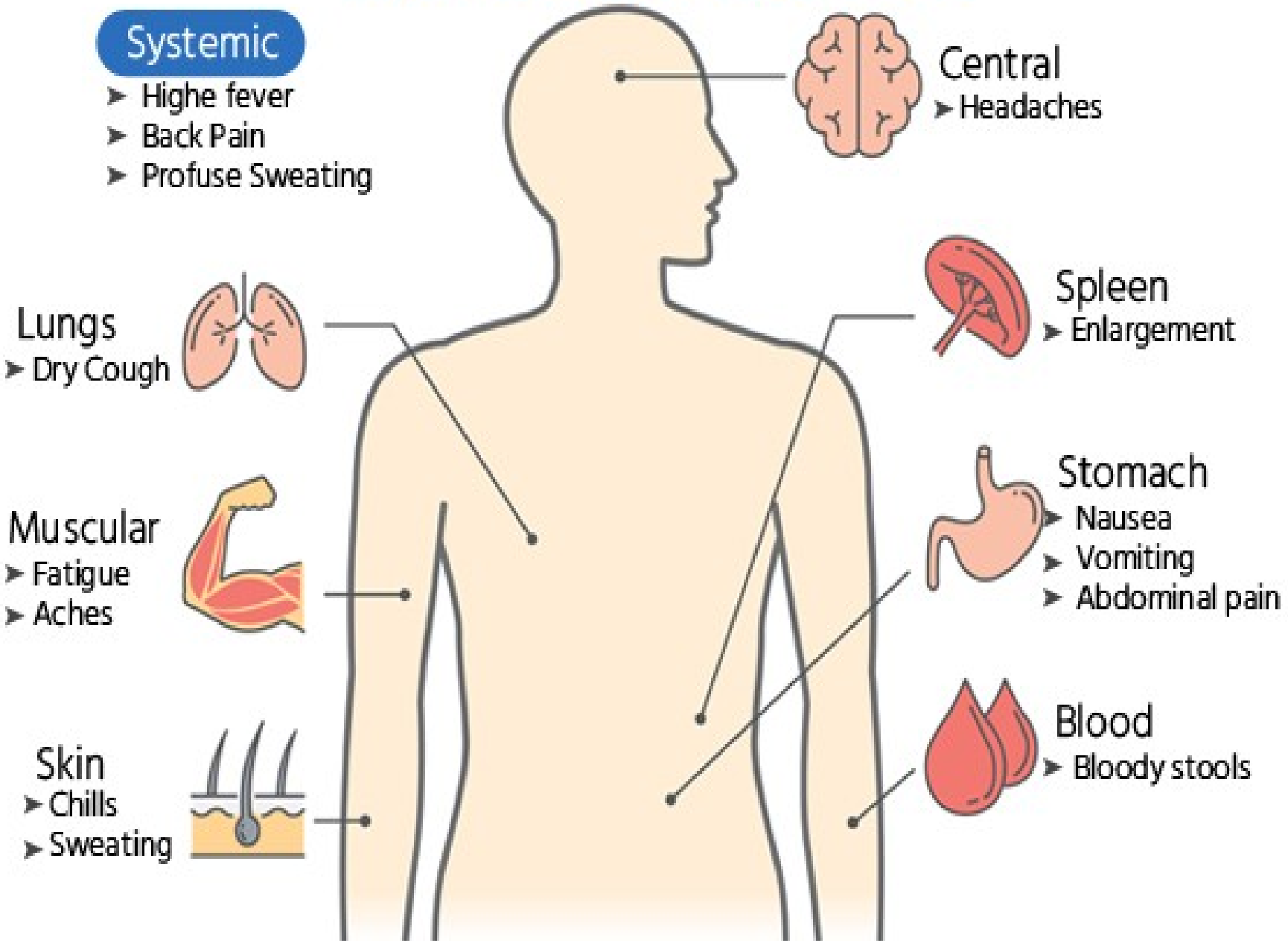
Vomiting

Fever

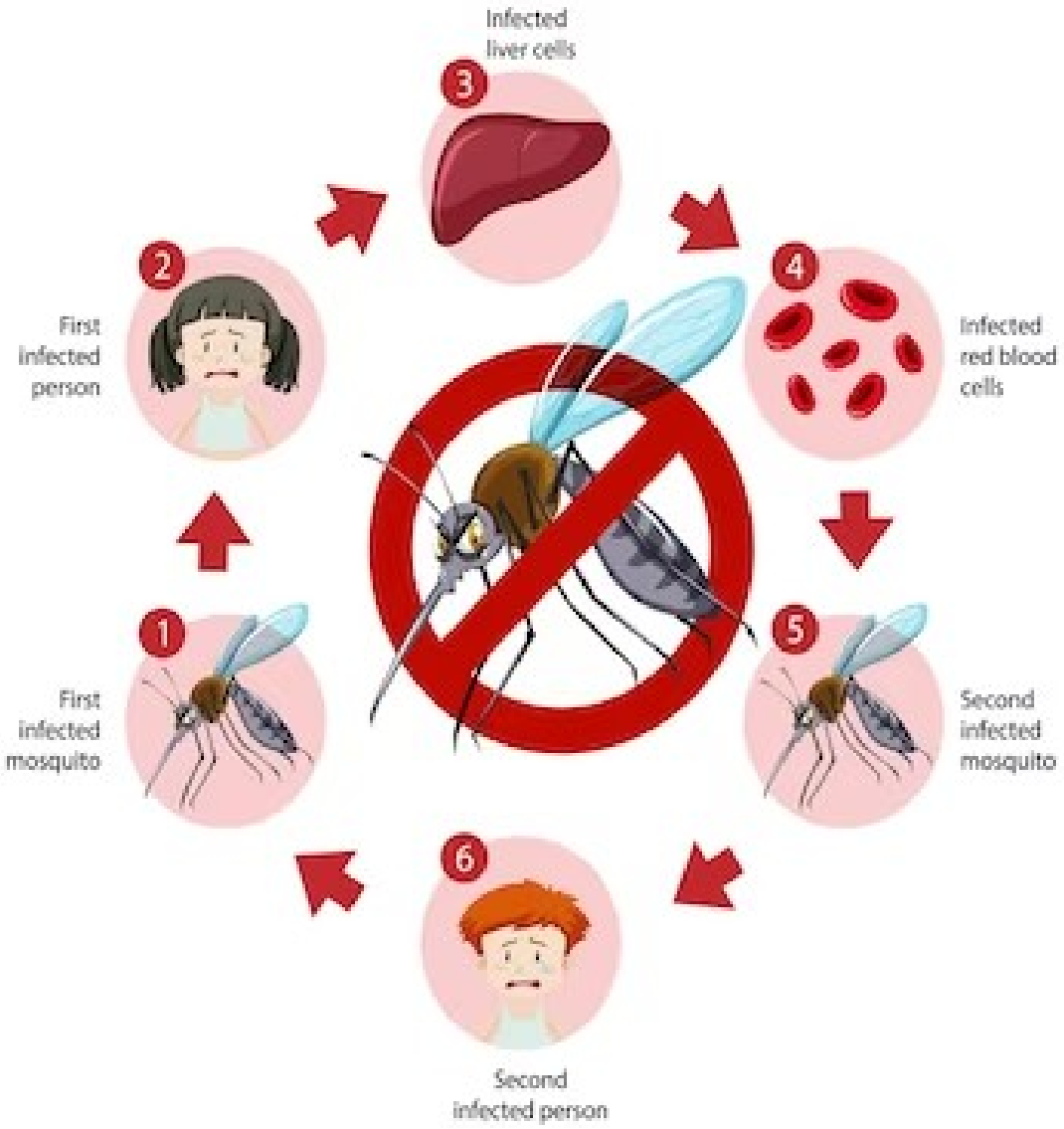
Nausea

Dry Cough

MALARIA SYMPTOMS



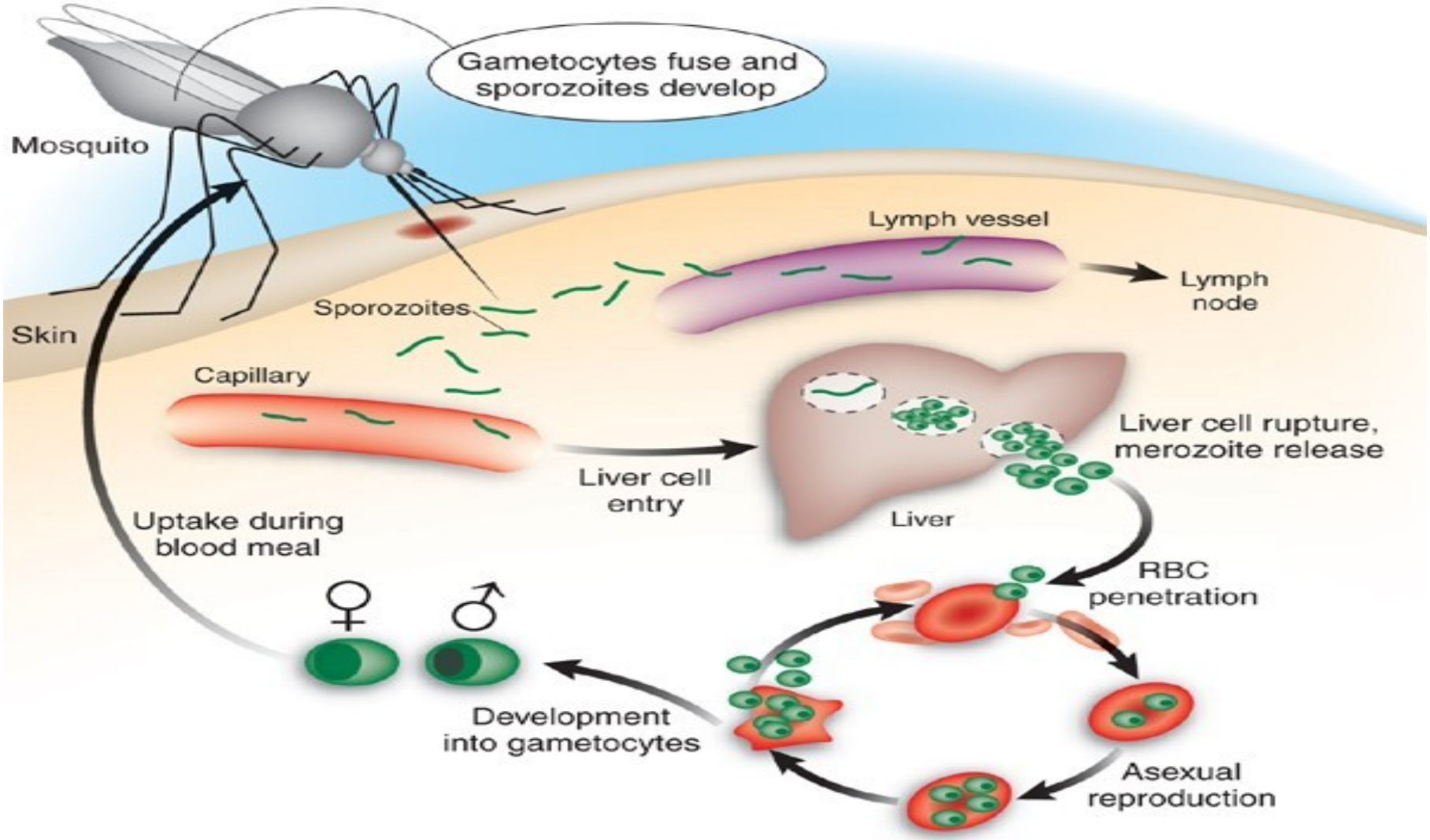
MALARIA TRANSMISSION CYCLE

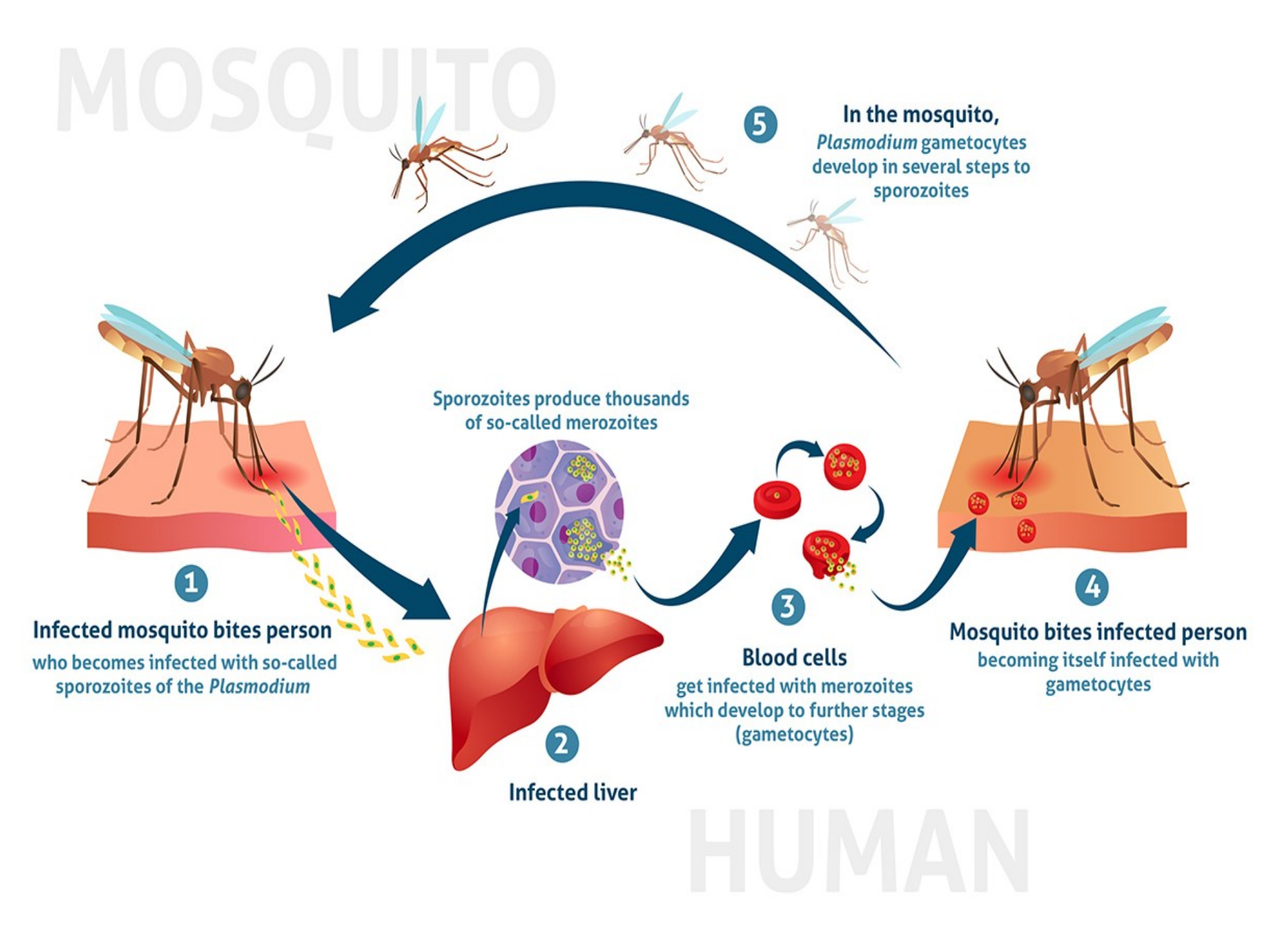


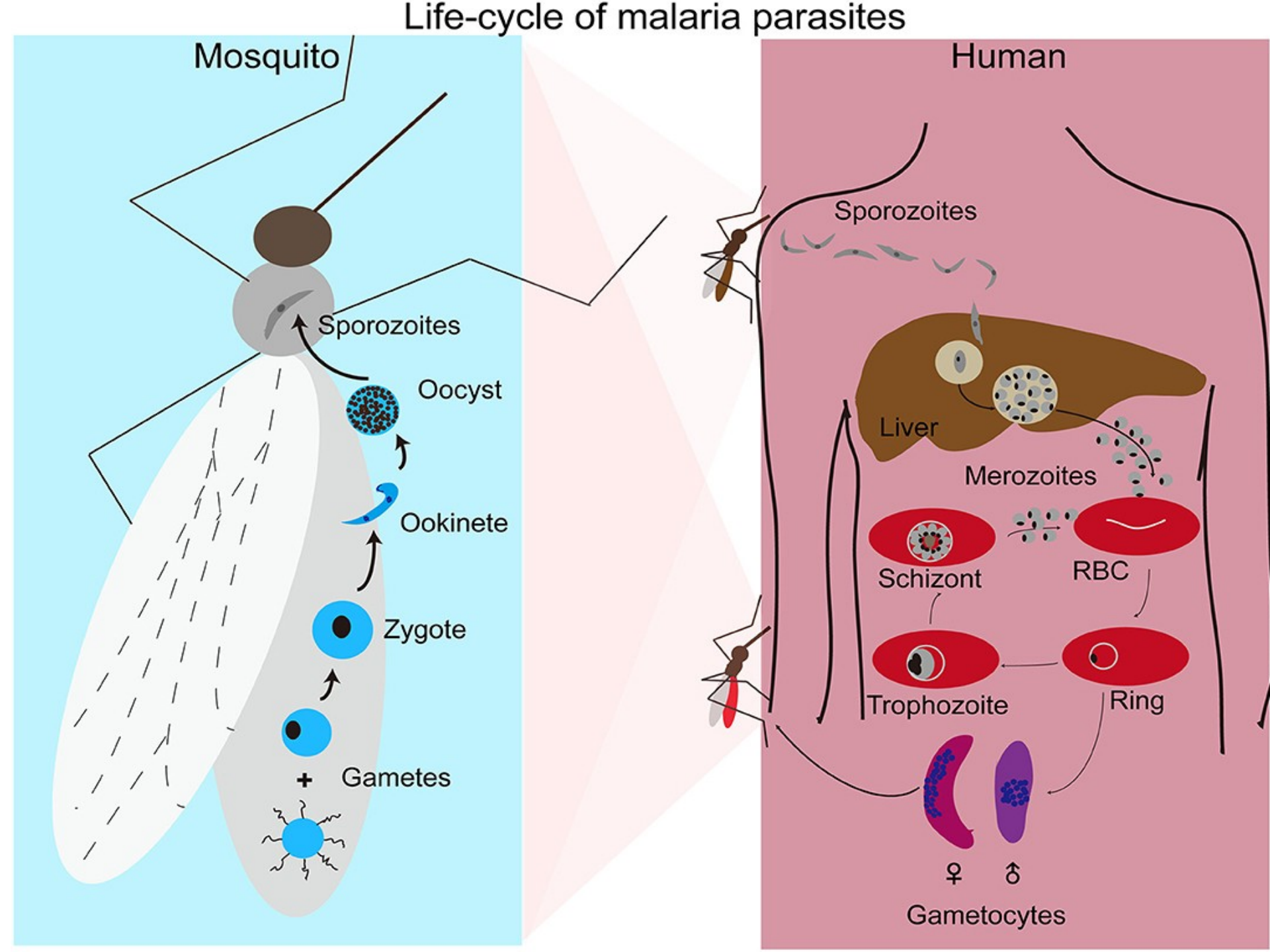
SYMPTOMS OF MALARIA

- Malaria typically is found in warmer regions of the world — in tropical and subtropical countries. Higher temperatures allow the Anopheles mosquito to thrive. Malaria parasites, which grow and develop inside the mosquito, need warmth to complete their growth before they are mature enough to be transmitted to humans.

Life cycle


Gametocytes fuse and sporozoites develop
Mosquito
Skin
Sporozoites
Lymph vessel
Lymph node
Capillary
Liver cell entry
Liver cell rupture, merozoite release
Liver
Uptake during blood meal
RBC penetration
Development into gametocytes
Asexual reproduction


MOSQUITO
5
In the mosquito,
Plasmodium gametocytes develop in several steps to sporozoites
Sporozoites produce thousands of so-called merozoites
1
Infected mosquito bites person
who becomes infected with so-called sporozoites of the *Plasmodium*
2
Infected liver
3
Blood cells
get infected with merozoites which develop to further stages (gametocytes)
4
Mosquito bites infected person
becoming itself infected with gametocytes
HUMAN

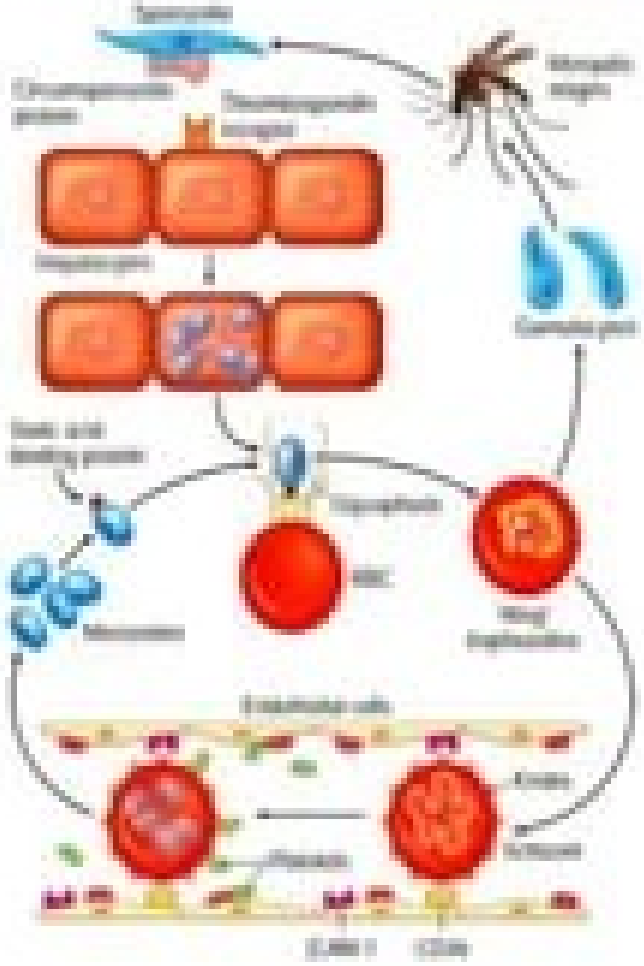

Life-cycle of malaria parasites
Mosquito
Sporozoites
Oocyst
Ookinete
Zygote
Gametes
Human
Sporozoites
Liver
Merozoites
Schizont
RBC
Trophozoite
Ring
♀
♂
Gametocytes

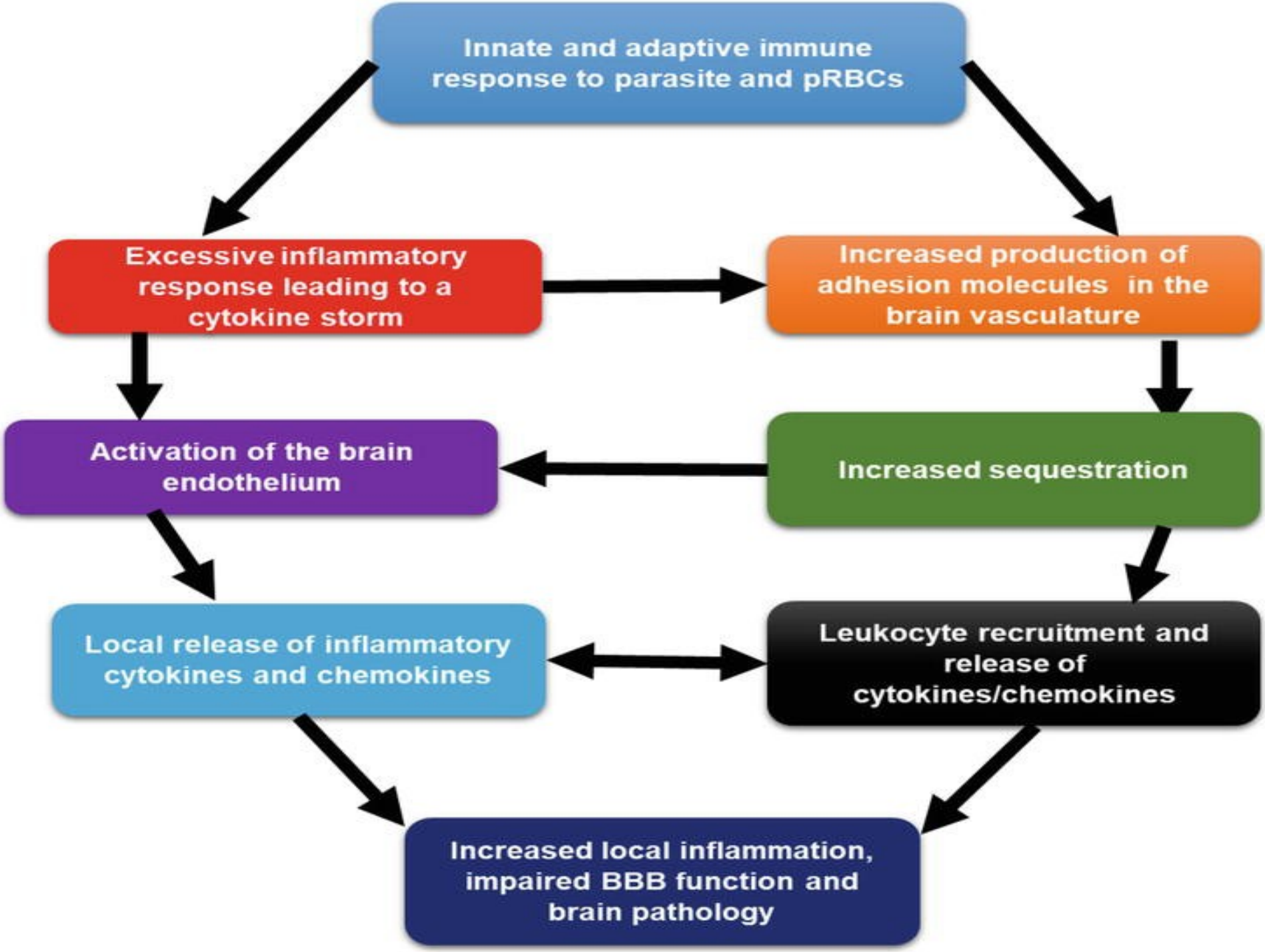
PATHOGENESIS OF SEVERE MALARIA

Infected RBCs to clump together(ROSETTE)

Stick to endothelial cell lining of small blood vessels (SEQUESTRATION)

Blood flow blocks which decreases tissue perfusion and leads to Ischemia [Manifestation of cerebral malaria]




Innate and adaptive immune response to parasite and pRBCs
Excessive inflammatory response leading to a cytokine storm
Increased production of adhesion molecules in the brain vasculature
Activation of the brain endothelium
Increased sequestration
Local release of inflammatory cytokines and chemokines
Leukocyte recruitment and release of cytokines/chemokines
Increased local inflammation, impaired BBB function and brain pathology

Pathophysiology of Severe Malaria, in particular *Plasmodium falciparum*, Sequestration due to Cytoadherence and Rosetting

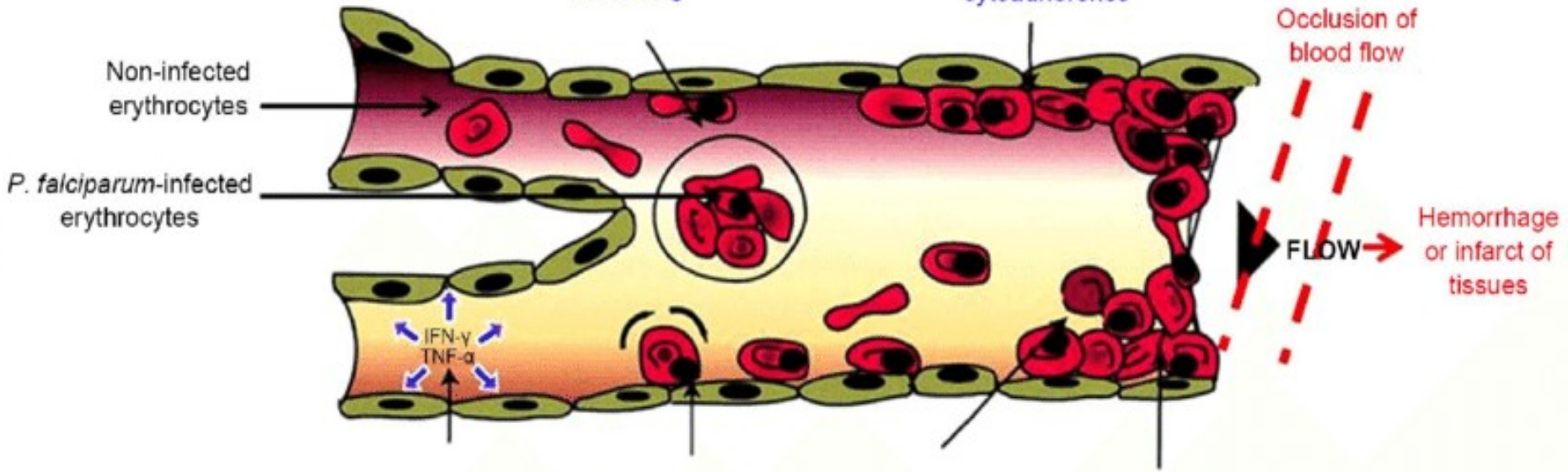
Augmented Sequestration
Removal of infected erythrocytes from Periphery circulation

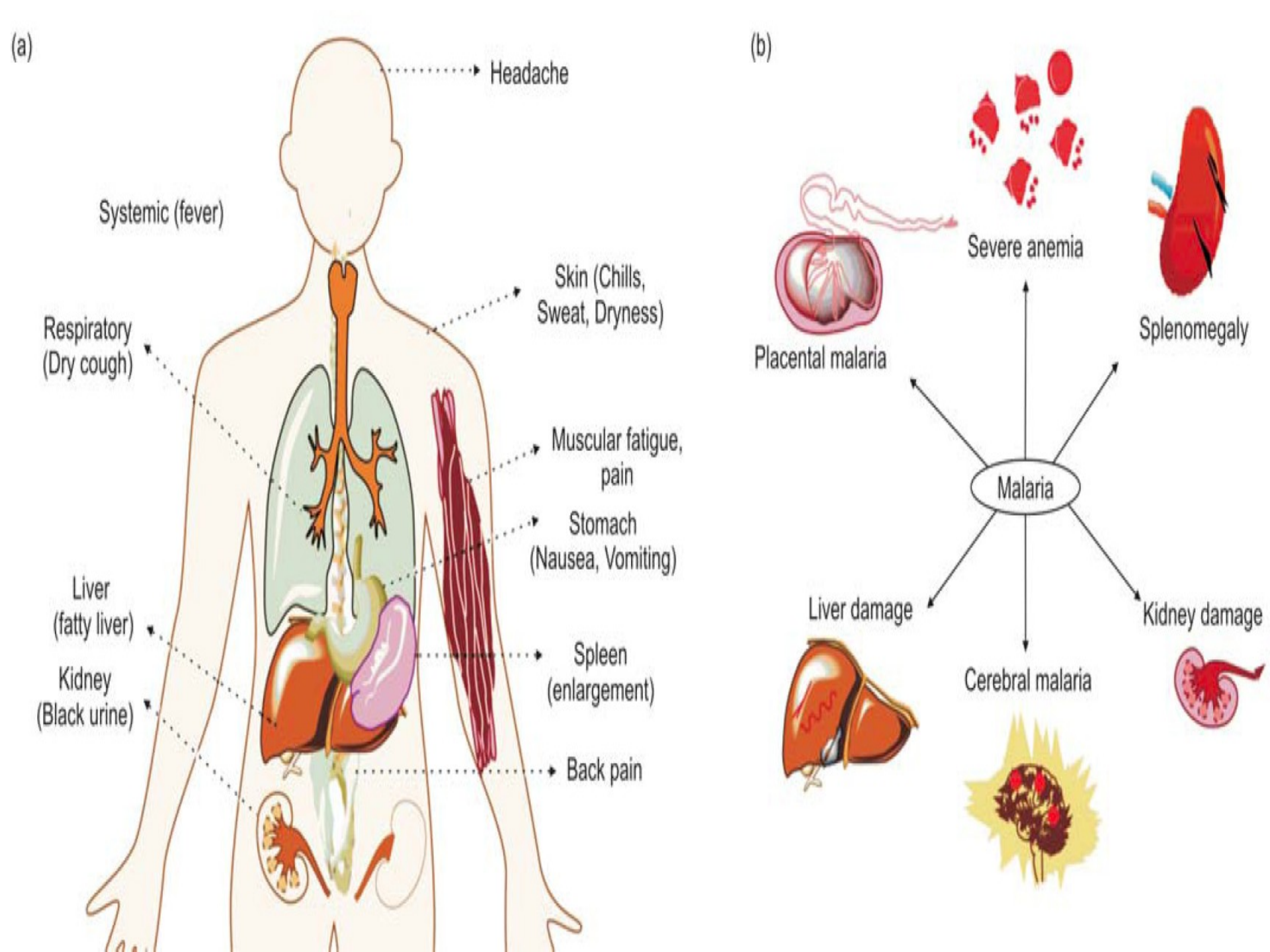
Spontaneous binding of infected-erythrocytes to non-infected erythrocytes

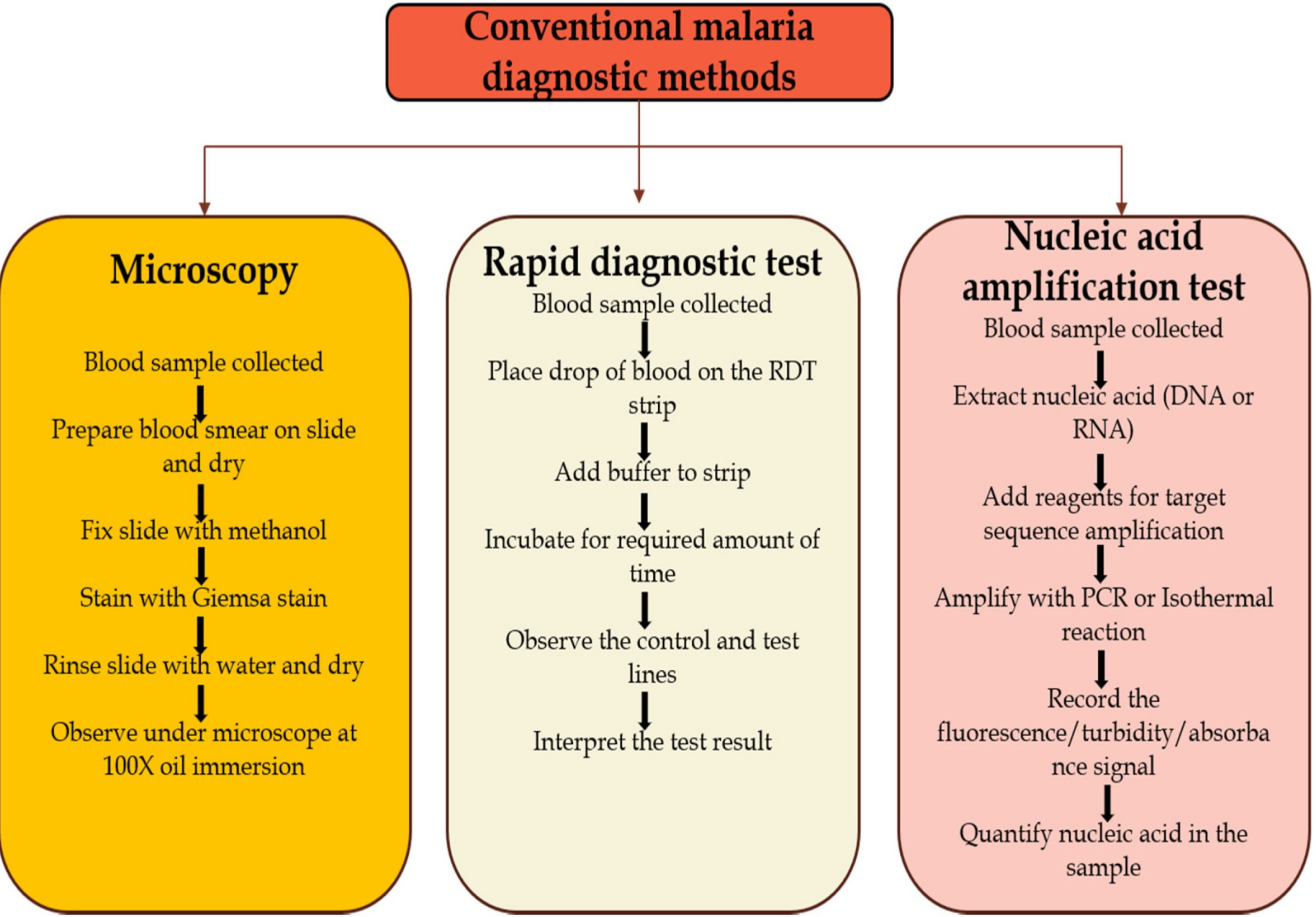
Infected-erythrocytes bind to vascular endothelium

Rosetting

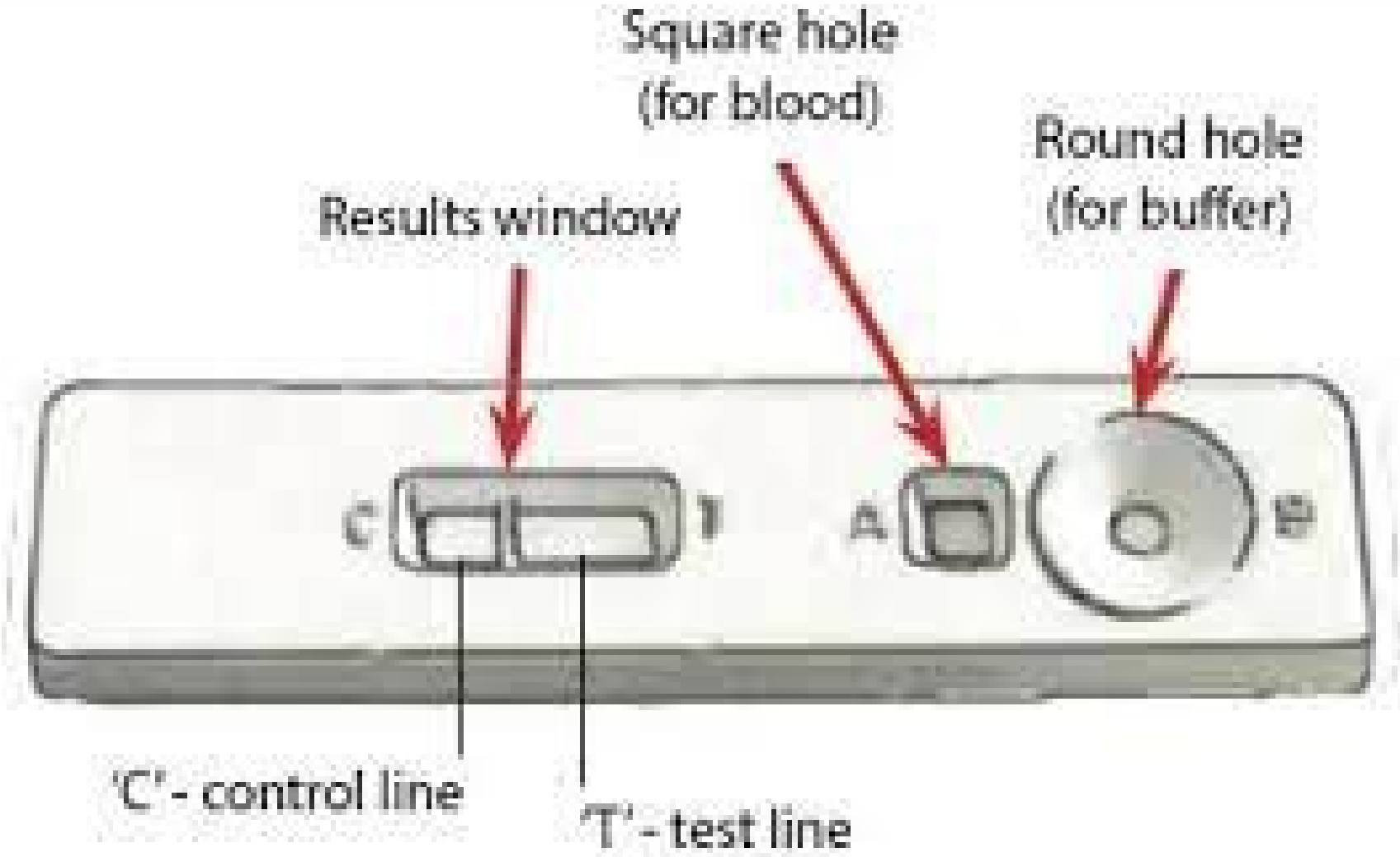
Endothelial cytoadherence

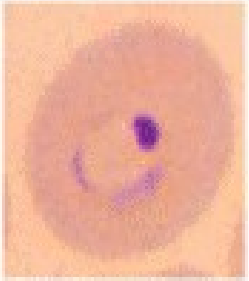
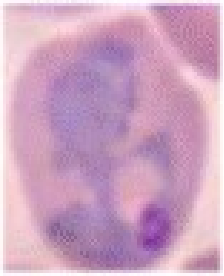
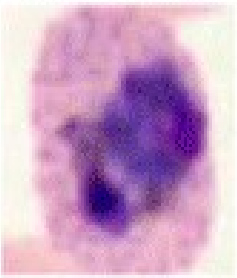
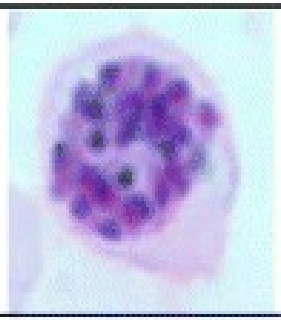
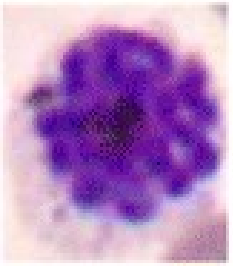
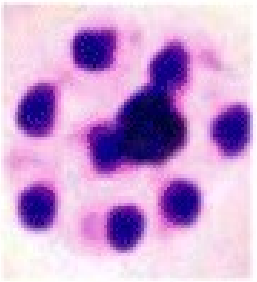
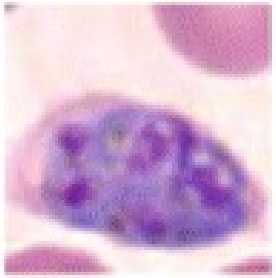
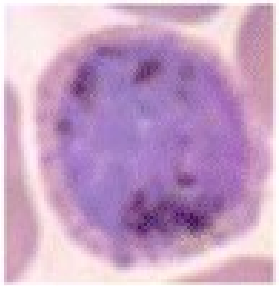
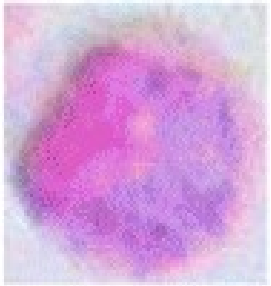



(a)
Headache
Systemic (fever)
Skin (Chills, Sweat, Dryness)
Respiratory (Dry cough)
Muscular fatigue, pain
Stomach (Nausea, Vomiting)
Liver (fatty liver)
Kidney (Black urine)
Spleen (enlargement)
Back pain
(b)
Severe anemia
Placental malaria
Splenomegaly
Malaria
Liver damage
Kidney damage
Cerebral malaria


Conventional malaria diagnostic methods
Microscopy
Blood sample collected
Prepare blood smear on slide and dry
Fix slide with methanol
Stain with Giemsa stain
Rinse slide with water and dry
Observe under microscope at 100X oil immersion
Rapid diagnostic test
Blood sample collected
Place drop of blood on the RDT strip
Add buffer to strip
Incubate for required amount of time
Observe the control and test lines
Interpret the test result
Nucleic acid amplification test
Blood sample collected
Extract nucleic acid (DNA or RNA)
Add reagents for target sequence amplification
Amplify with PCR or Isothermal reaction
Record the fluorescence/turbidity/absorbance signal
Quantify nucleic acid in the sample

RAPID DIAGNOSTIC TEST

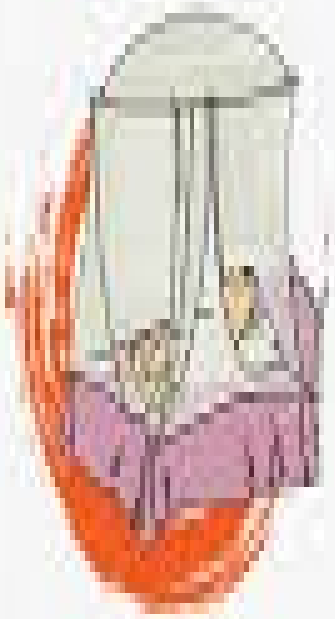


Species / Stage	Falciparum	Vivax	Malariae	Oval
Ring Stage				
Trophozoite				
Schizont				
Gametocyte				

25th April, 2019

WORLD MALARIA DAY

Zero Malaria Starts With Me



CONCLUSION/SUMMARY

THANKS