Malaria & Travel Medicine

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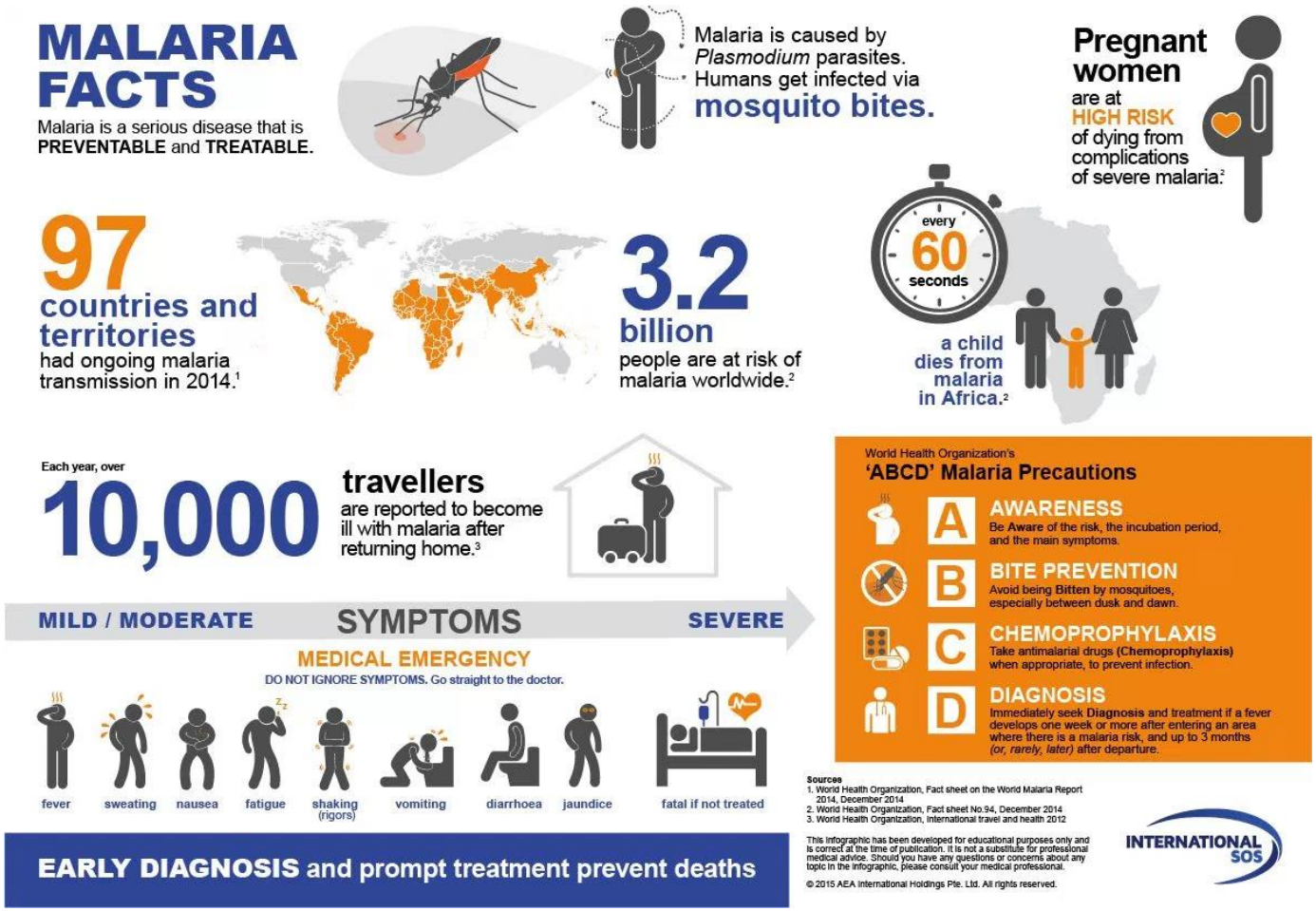
World Facts

- 97 countries have malaria
- 216 million malaria cases worldwide in 2018
- 445 000 malaria deaths worldwide in 2018
- 10 000 world travelers become infected every year

World Facts


MALARIA FACTS
Malaria is a serious disease that is PREVENTABLE and TREATABLE.
Malaria is caused by Plasmodium parasites. Humans get infected via mosquito bites.
Pregnant women are at HIGH RISK of dying from complications of severe malaria.[2]
97 countries and territories had ongoing malaria transmission in 2014.[1]
3.2 billion people are at risk of malaria worldwide.[2]
every 60 seconds a child dies from malaria in Africa.[2]
Each year, over 10,000 travellers are reported to become ill with malaria after returning home.[3]
MILD / MODERATE SYMPTOMS SEVERE
MEDICAL EMERGENCY
DO NOT IGNORE SYMPTOMS. Go straight to the doctor.
fever
sweating
nausea
fatigue
shaking (rigors)
vomiting
diarrhoea
jaundice
fatal if not treated
EARLY DIAGNOSIS and prompt treatment prevent deaths
World Health Organization's
'ABCD' Malaria Precautions
A AWARENESS
Be Aware of the risk, the incubation period, and the main symptoms.
B BITE PREVENTION
Avoid being Bitten by mosquitoes, especially between dusk and dawn.
C CHEMOPROPHYLAXIS
Take antimalarial drugs (Chemoprophylaxis) when appropriate, to prevent infection.
D DIAGNOSIS
Immediately seek Diagnosis and treatment if a fever develops one week or more after entering an area where there is a malaria risk, and up to 3 months (or, rarely, later) after departure.
Sources
1. World Health Organization, Fact sheet on the World Malaria Report 2014, December 2014
2. World Health Organization, Fact sheet No.94, December 2014
3. World Health Organization, International travel and health 2012
This infographic has been developed for educational purposes only and is correct at the time of publication. It is not a substitute for professional medical advice. Should you have any questions or concerns about any topic in the infographic, please consult your medical professional.
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INTERNATIONAL SOS

Global technical strategy for malaria 2016-2030

Goals, milestones and targets for the *Global technical strategy for malaria 2016–2030*

GOALS	MILESTONES		TARGETS
	2020	2025	2030
1. Reduce malaria mortality rates globally compared with 2015	At least 40% 18% reduction achieved 22% off track	At least 75%	At least 90%
2. Reduce malaria case incidence globally compared with 2015	At least 40% 3% reduction achieved 37% off track	At least 75%	At least 90%
3. Eliminate malaria from countries in which malaria was transmitted in 2015	At least 10 countries On track	At least 20 countries	At least 35 countries
4. Prevent re-establishment of malaria in all countries that are malaria-free	Re-establishment prevented On track	Re-establishment prevented	Re-establishment prevented

Malaria in Travelers

- Non-immune travelers exposed to mosquito bites between dusk and dawn
- This includes previously semi-immune travelers who have lost or partially lost their immunity during stays of 6 months or more in countries or areas of no risk
- travelers who have migrated to countries and areas of no risk are at particular risk when they travel to malarious areas to visit friends and relatives
- Most cases of *falciparum* malaria in travelers occur because of poor adherence or inappropriate prophylactic malaria drug regimens and failure to take adequate precautions against mosquito bites
- Adherence to chemoprophylaxis can be improved if travelers are informed of the risk of infection and believe in the benefit of prevention strategies
- Late-onset *vivax* and *ovale* malaria may occur despite effective prophylaxis

Transmission

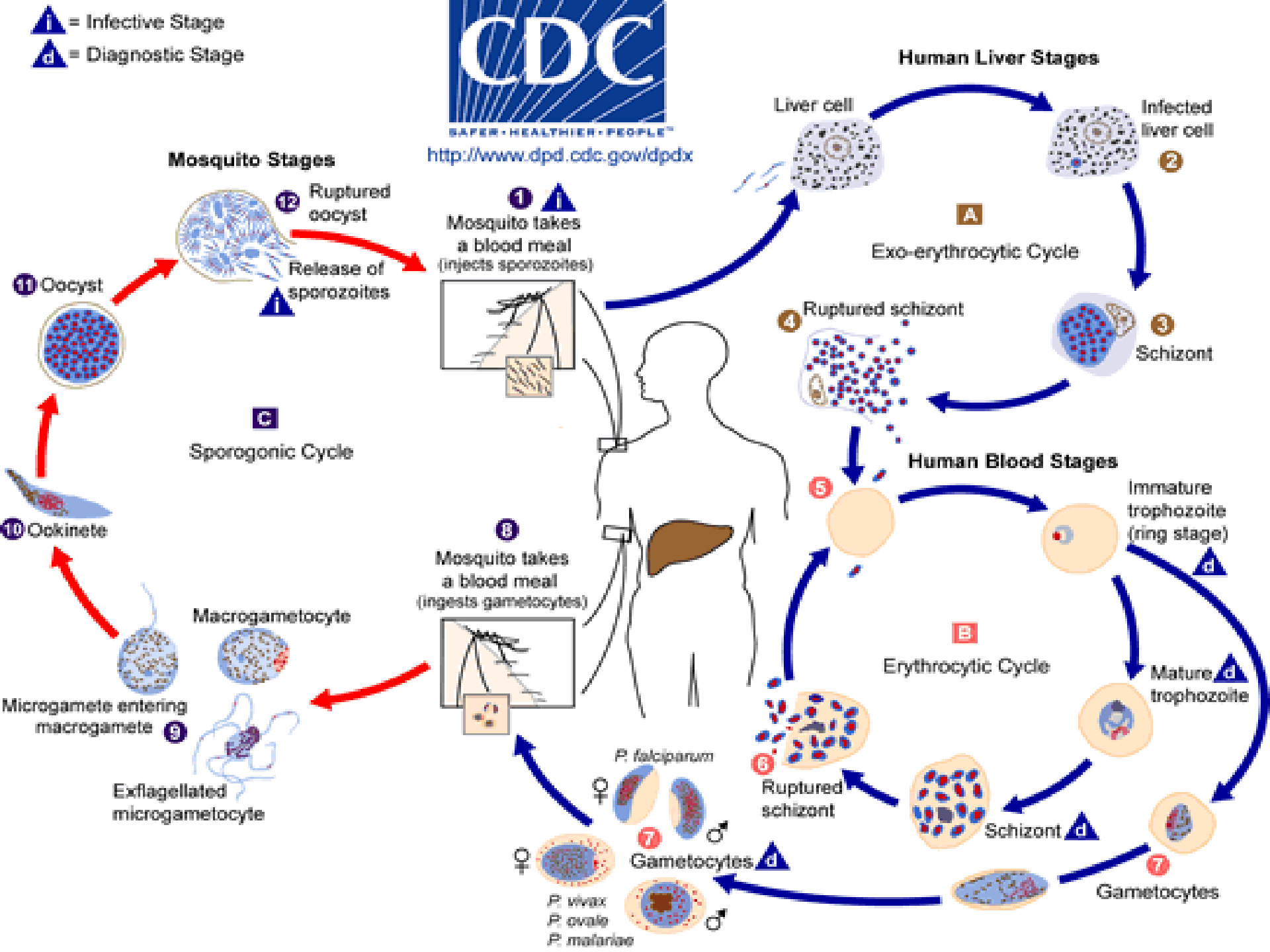
- Transmission: Human to Human by anopheles mosquito
  - BETWEEN DUSK AND DAWN
- BLOOD TRANSFUSION
- CONTAMINATED NEEDLES
- CONGENITAL

MALARIA

- ***Plasmodium falciparum (Pf):*** **The most serious**
- ***P. vivax (Pv)***
- ***P. ovale (Po)***
- ***P. Malariae (Pm)***
- **Another *plasmodium?***

Simian Monkey to Human transmission (zoonotic malaria)

- *P. Knowlesi (pk), p. simium (ps)*
- South East Asia (pk), south America (ps)
- Pk Looks like *P. Malariae, Ps looks like P. vivax*
- Need PCR for diagnosis
- Can cause severe disease


i = Infective Stage
d = Diagnostic Stage
CDC
SAFER·HEALTHIER·PEOPLE™
http://www.dpd.cdc.gov/dpdx
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
B
Erythrocytic Cycle
6
Ruptured schizont
Schizont
d
7
Gametocytes
Gametocytes
d
P. falciparum
P. vivax
P. ovale
P. malariae
8
Mosquito takes a blood meal
(ingests gametocytes)
Mosquito Stages
1
i
Mosquito takes a blood meal
(injects sporozoites)
12
Ruptured oocyst
Release of sporozoites
i
11
Oocyst
C
Sporogonic Cycle
10
Ookinete
Macrogametocyte
Microgamete entering macrogamete
9
Exflagellated microgametocyte

Plasmodium falciparum

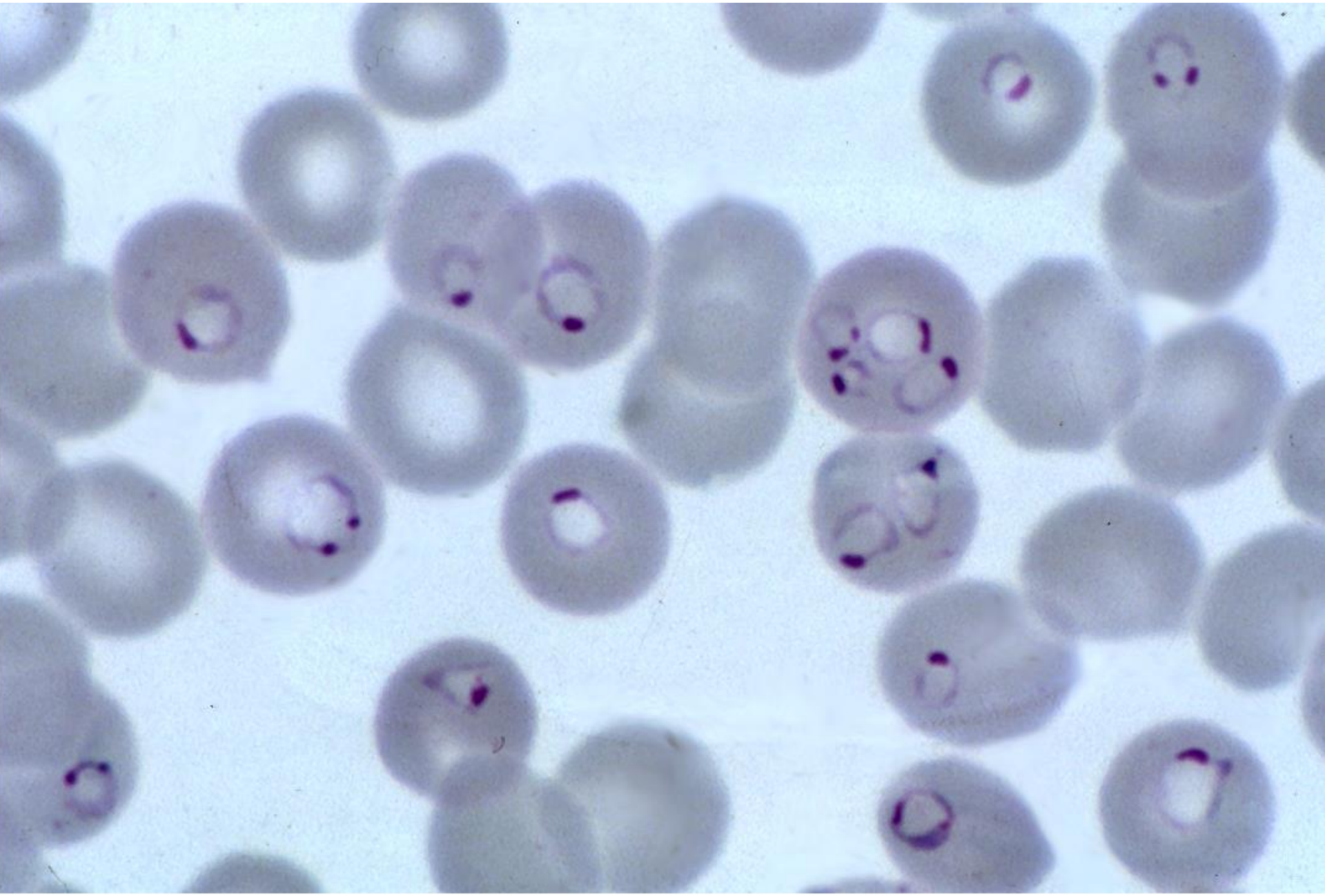
- Most highly pathogenic species
- Resistant to many antimalarial drugs
- The species that causes the most morbidity and mortality worldwide
- Represents the major cause of malaria in tropical countries
- Responsible for the sporadic great regional pandemics that sometimes occur in subtropics

Plasmodium falciparum

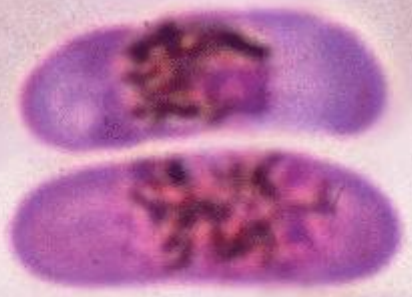
- Infects mature and young erythrocytes
- The surface of erythrocytes infected with late stage trophozoites or schizonts is altered so they stick to endothelial cells in various tissues (cytoadherence)
- The pre-erythrocytic cycle starts immediately after injection of the sporozoites by the mosquito
- Schizogony is particularly prolific in all stages (pre-erythrocytic, erythrocytic and sporogony) that may be the cause of its success as a species and its virulence

Plasmodium falciparum

- Infection in the peripheral blood is characterized by the presence of ring forms and gametocytes, whereas late trophozopites and schizonts are only seen exceptionally
- The level of parasitaemia may be high and multiple infection in a single erythrocyte is common
- The gametocytes are characteristically crescent-shaped and, unlike the gametocytes of other species, are very slow to reach maturity (up to 10 days) and early forms of gametocytes are sequestered.



Gametocytes



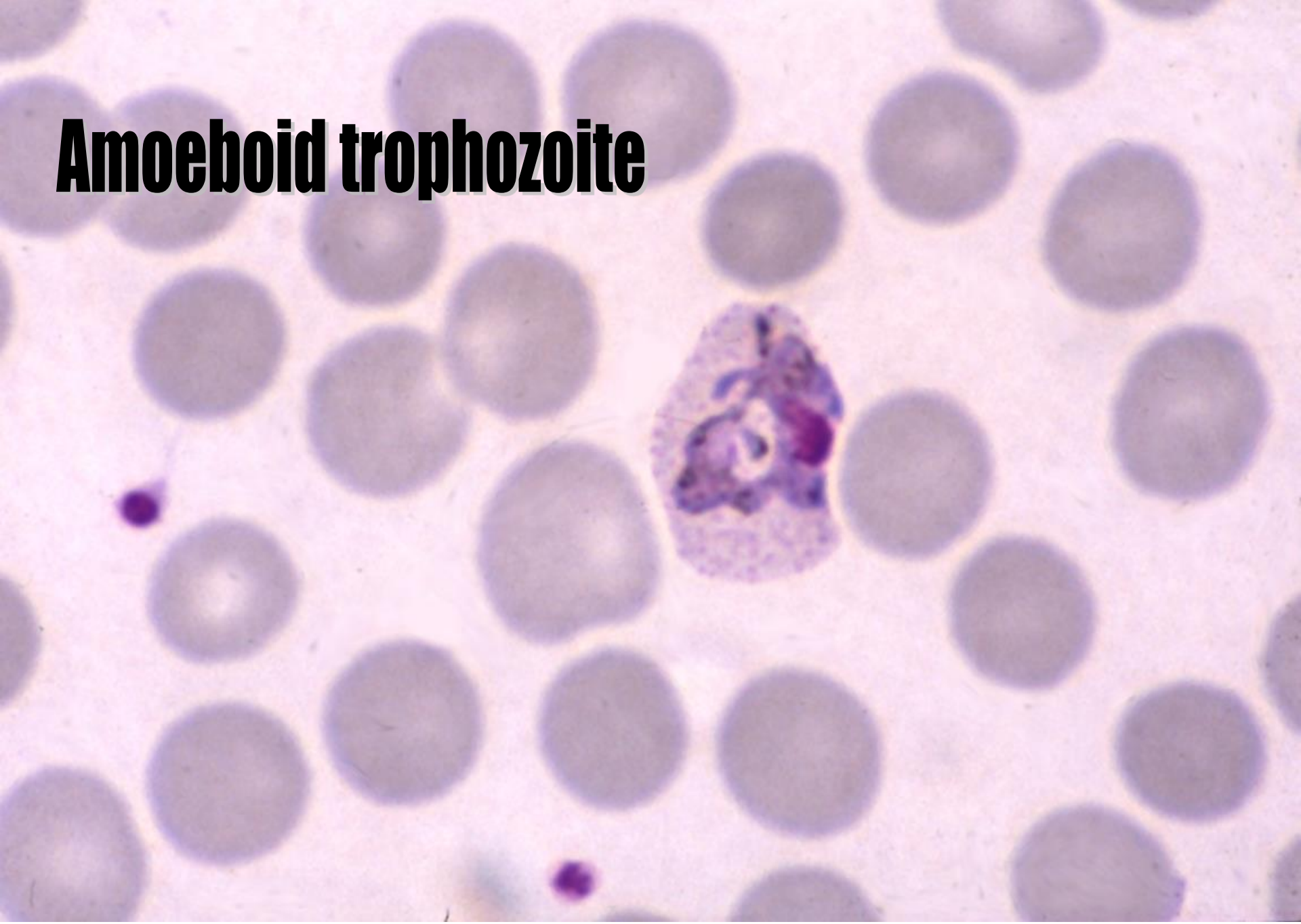
Macrogamete

Microgamete

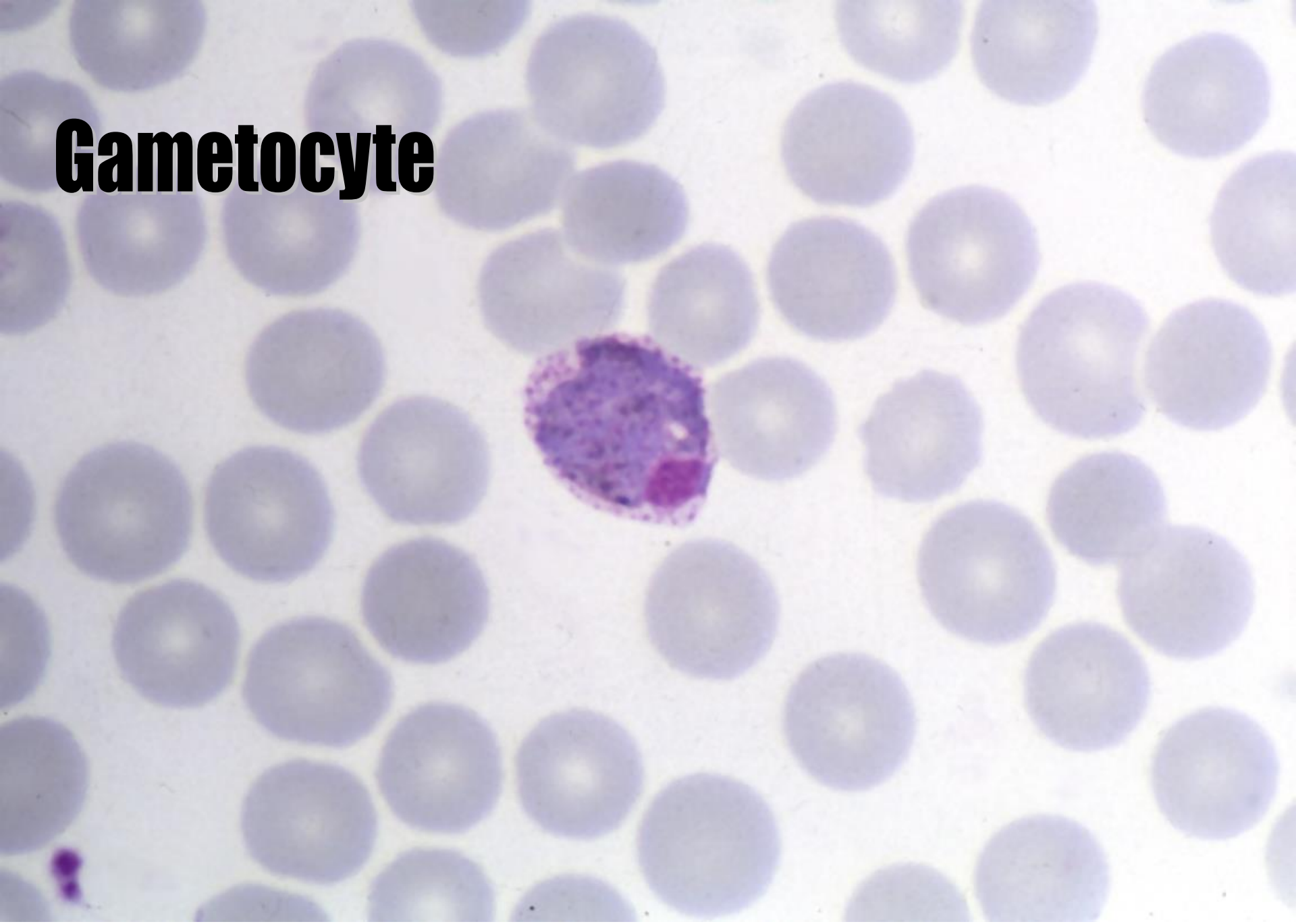
P. vivax

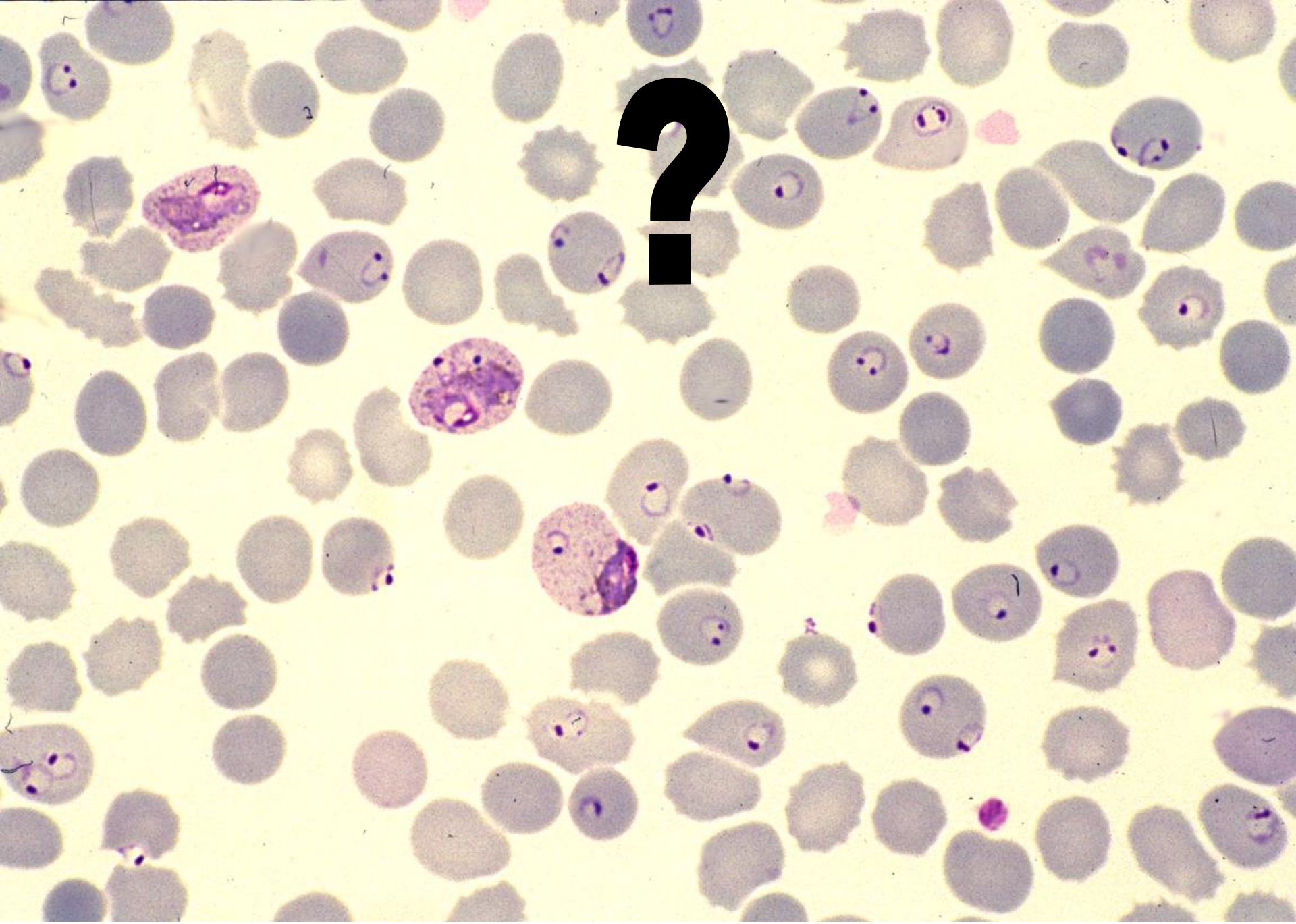
- Occurs throughout most of the temperate zones as well as large areas of the tropics (but is mainly absent from tropical West Africa)
- It causes ‘benign’ tertian malaria.
- polymorphic and the subspecies status proposed for some strains may be justified
- Restriction of erythrocyte invasion to reticulocytes bearing Duffy blood group determinants (explains why RBCs infected with trophozoites of *P. vivax* are sometimes described as larger than normal)
- The presence of caveolar structures on the surface of the infected erythrocyte membrane take up stain, and are described as Schüffner’s dots
- After invading the hepatocyte some of the sporozoites may transform into hypnozoites, then remain latent for months or years and be responsible for subsequent relapses.

Amoeboid trophozoite



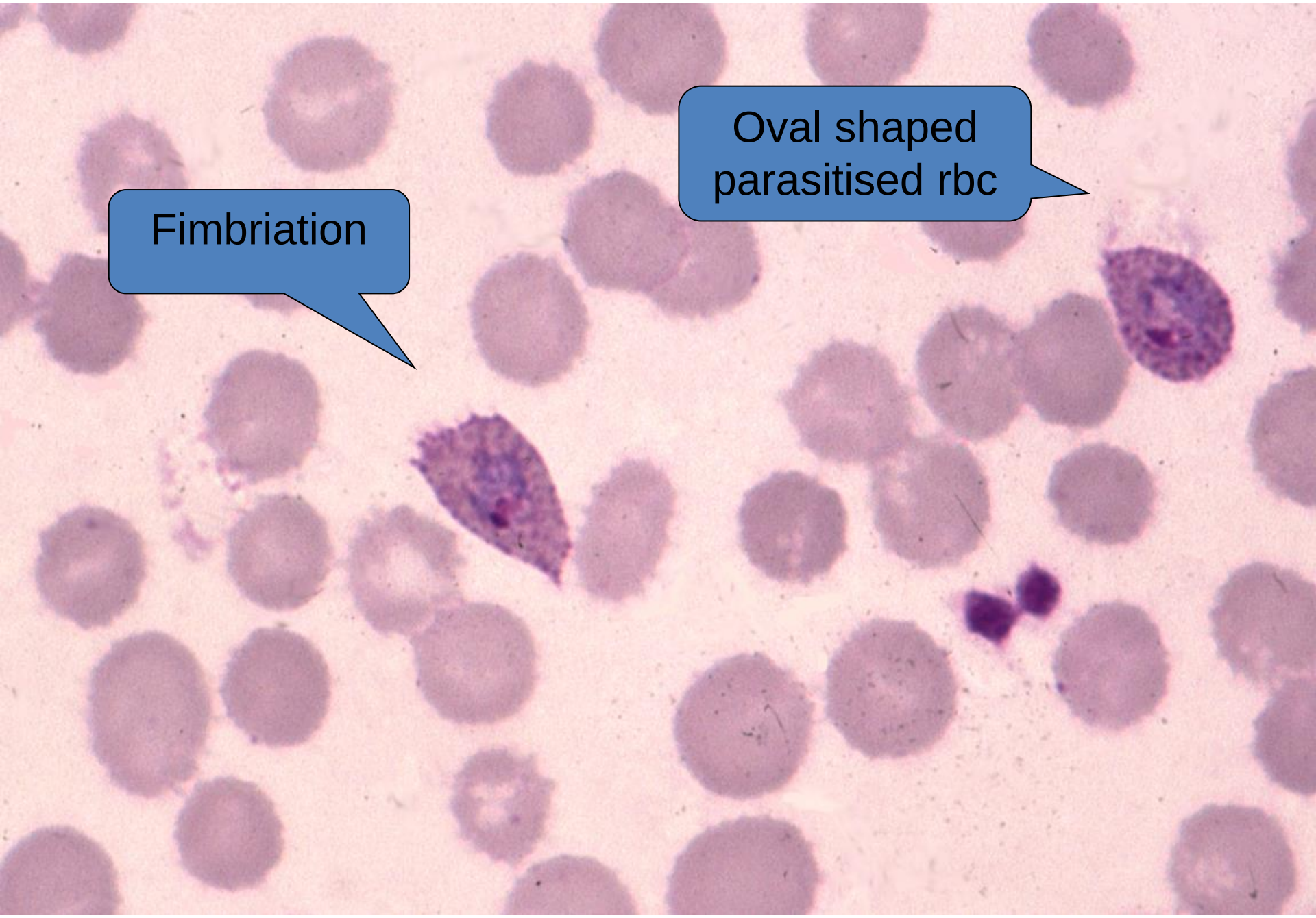
Gametocyte





P. ovale

- Distinct from *P. vivax* in minor morphological differences, antigenic and molecular differences
- Most of the biological and clinical features are identical
- Major biological difference is that *P. ovale* can infect Duffy negative reticulocytes, whereas *P. vivax* cannot

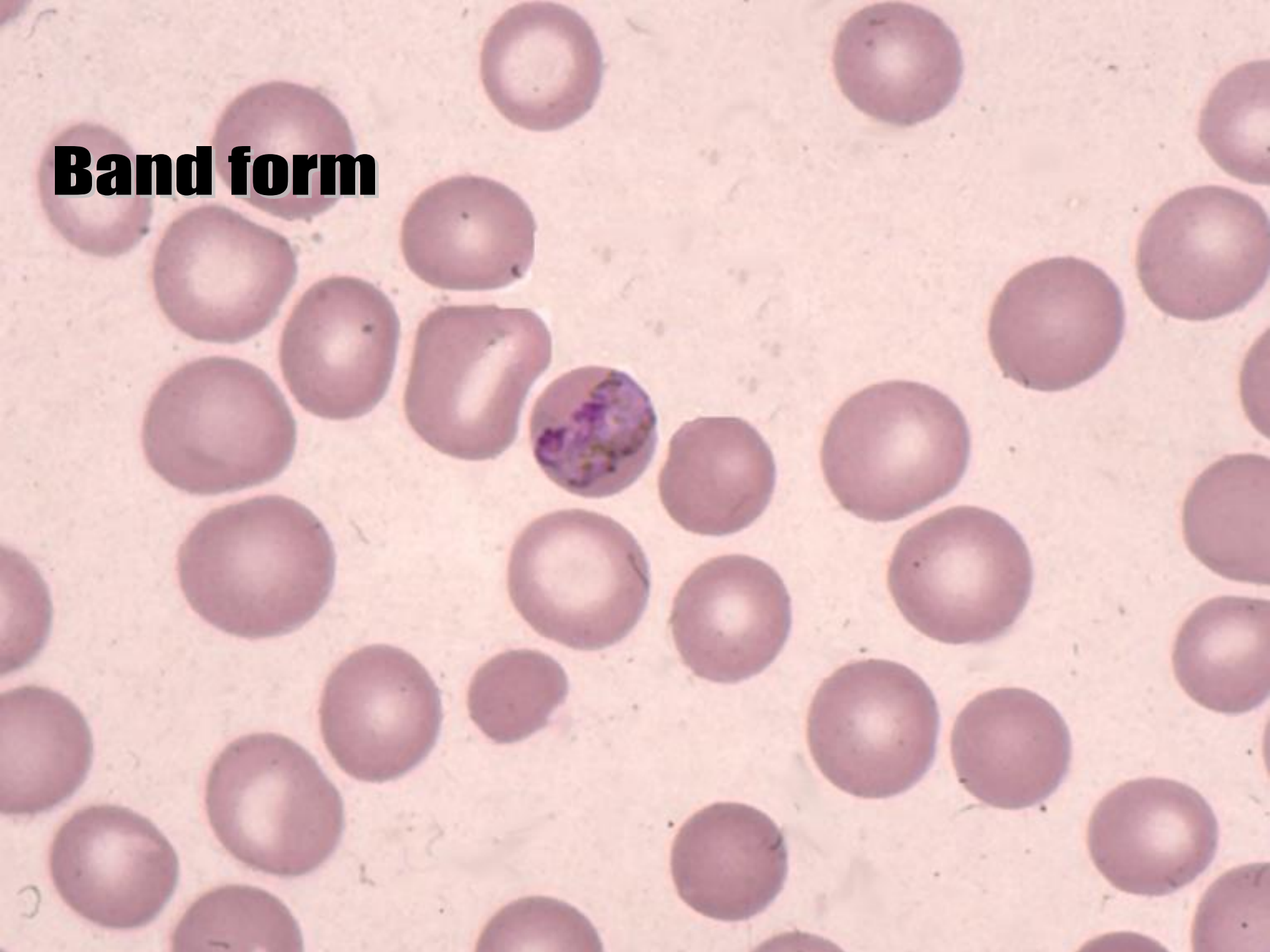

Oval shaped parasitised rbc
Fimbriation

P. malariae

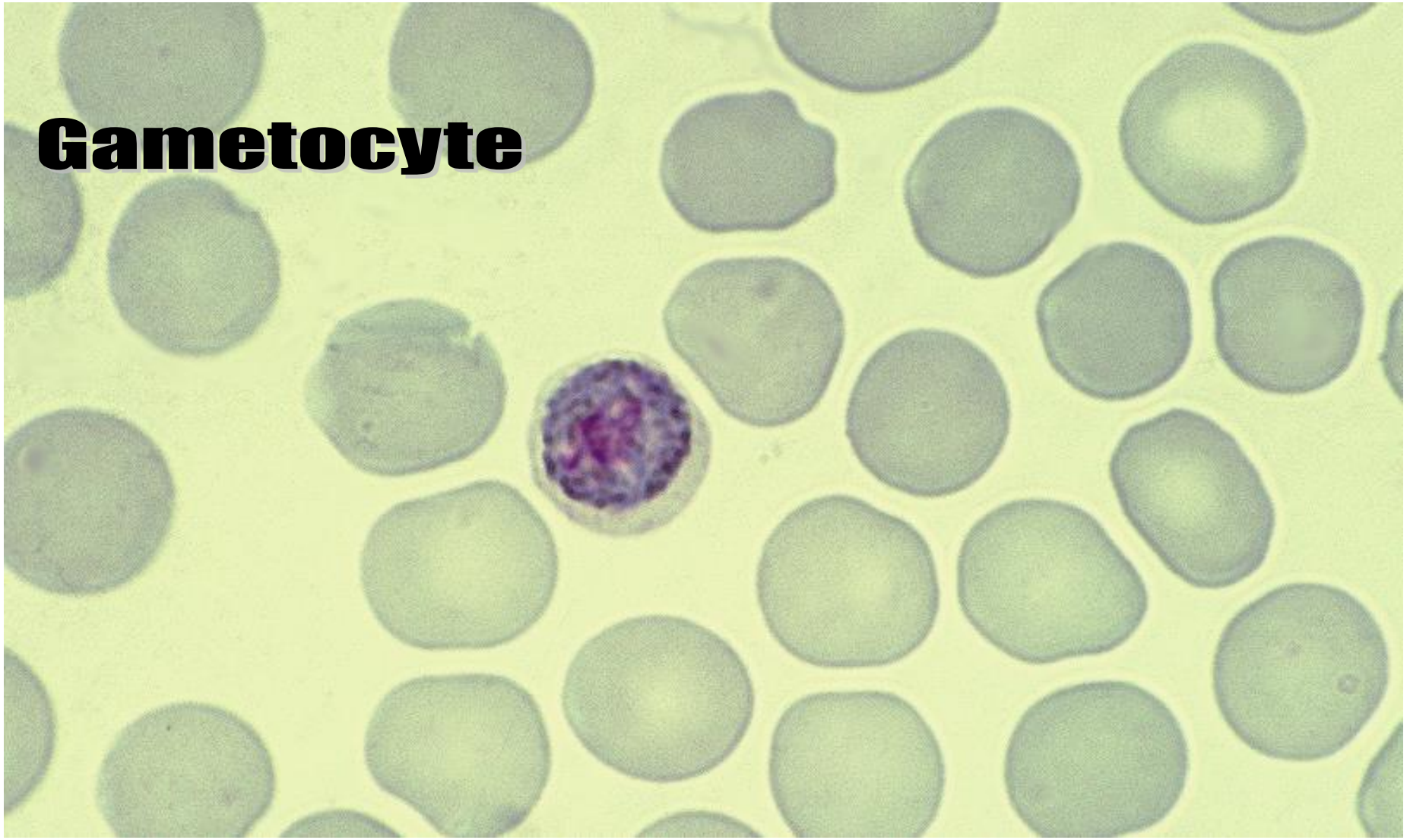
- Differs from the other three human malaria parasites in its slow development and its longer asexual cycle
- Development is slow in both the vector and the human host because of less efficient schizogony.
- The asexual cycle is 72 hours instead of 48 hours – hence ‘quartan malaria’ – because fever paroxysms occur every 4^{th} day (according to the Roman custom of regarding day 0 as day 1).

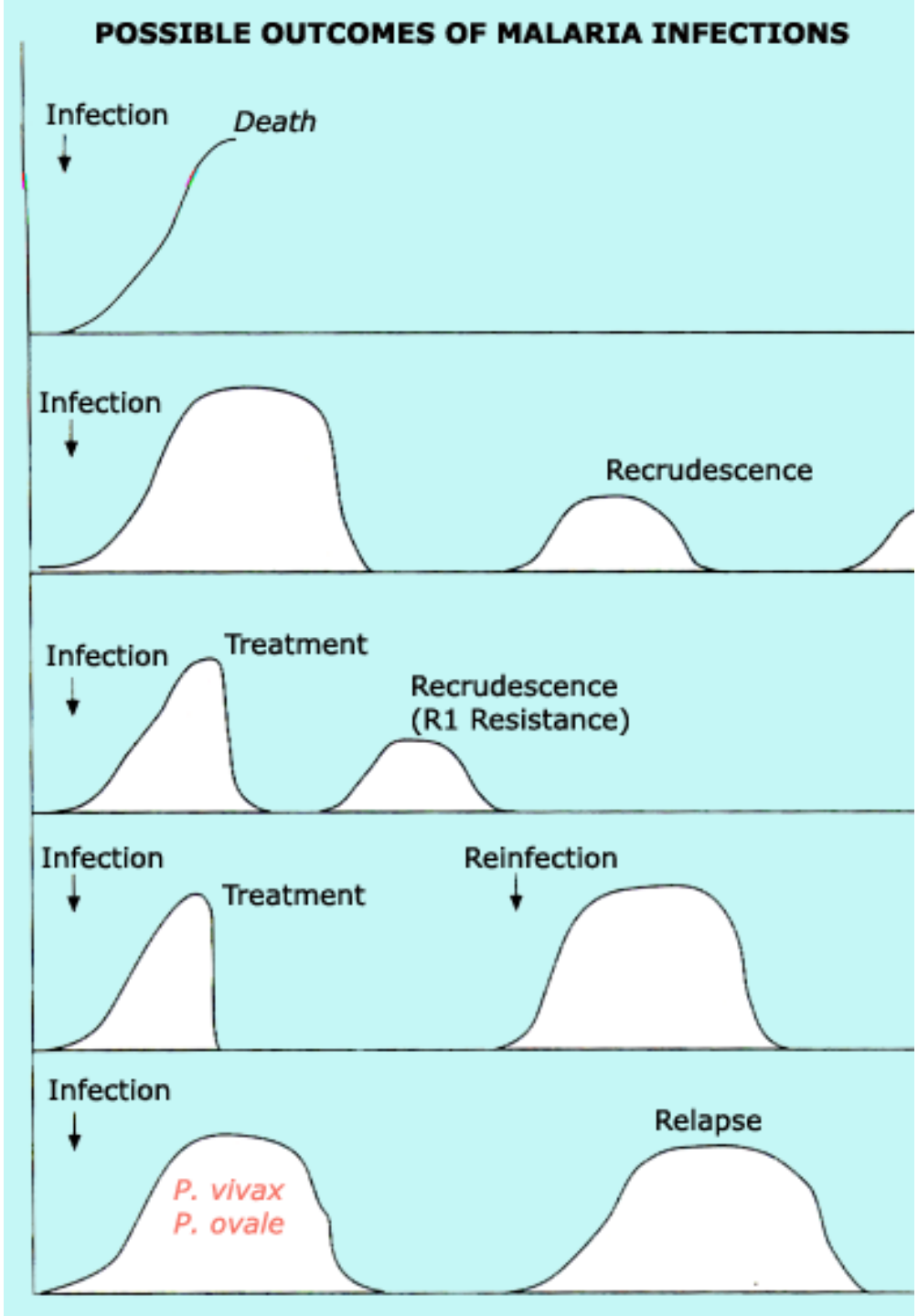
P. malariae

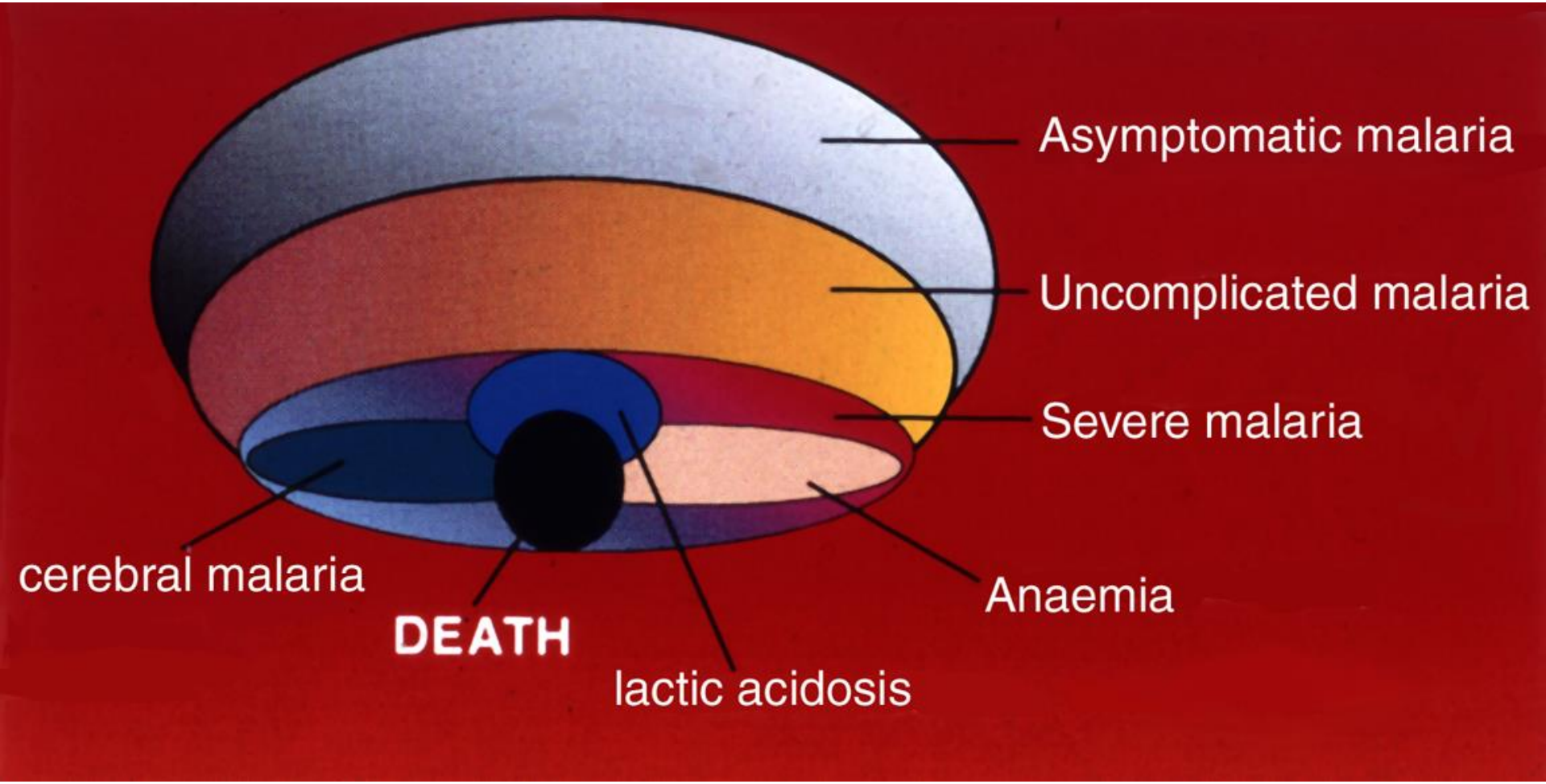
- Infects old erythrocytes, explaining why infected cells are often described as ‘smaller’ by microscopists
- The presence of ‘knobs’ at the surface of infected erythrocytes, which are similar to *P. falciparum*, but the cells do not exhibit any cytoadherence (and so no sequestration)
- The surface of infected erythrocytes does not exhibit any caveolar/vesicle complexes and Schüffner’s dots are absent
- Sporozoites of *P. malariae* do not transform into hypnozoites, and so there are no relapses
- *P. malariae* can survive for a very long time in the peripheral blood (10 years or more) at a very low level of parasitaemia occasionally producing detectable peaks with a recrudescence of clinical symptoms.


Band form

Gametocyte




POSSIBLE OUTCOMES OF MALARIA INFECTIONS
Infection
Death
Infection
Recrudescence
Infection
Treatment
Recrudescence
(R1 Resistance)
Infection
Treatment
Reinfection
Infection
Relapse
P. vivax
P. ovale



Conceptual diagram of malaria epidemiology

History

- **Travel to malaria endemic area**
  - ***Pf* upto 1 year from travel (usually first 3 months)**
  - ***Pm* upto 10 years**
- Non specific: Fever
- Sweats, chills
- Myalgia
- Headache
- Diarrhea
- Cough
- Jaundice, dark urine
- Confusion, Seizures

Signs

- Fever, HR, BP, O2
- Level of consciousness
- Evidence of seizures
- Splenomegaly
- Jaundice
- Anemia

Does this patient have malaria?

- Acquired during travel:
  - Fever +LR 5.1
  - Splenomegaly +LR 6.5
  - Hyperbilirubinemia +LR 7.3
  - Thrombocytopenia +LR 5.6
- Living in endemic region:
  - Splenomegaly +LR 3.3
  - Hepatomegaly +LR 2.4

JAMA. 2010;304(18):2048-2056

Malaria clinical spectrum

- Most fever or flu-like illness
- Fatalities with *Pf* (occasionally with splenic rupture)
- Cerebral malaria (*Pf*) - may be focal or generalized symptoms
- Hypoglycemia - from disease and treatment (quinine leads to insulin release)
- Risk Acute Respiratory Distress Syndrome (*Pf*) due to capillary leak - need to limit fluids
- Acute renal failure (*Pf*) - common complication of severe malaria

WHO criteria – severe malaria

EITHER

History of recent possible exposure and no other recognized pathology

OR

Asexual forms of *Pf* on blood smear

AND

<u>Any</u> one or more of the following 11 features:

1) Impaired consciousness or coma
2) Severe normocytic anemia
3) Renal failure
4) Pulmonary edema or adult respiratory distress syndrome (ARDS)
5) Hypoglycemia
6) Circulatory collapse, shock
7) Spontaneous bleeding/disseminated intravascular coagulation
8) Repeated generalized convulsions
9) Acidemia/acidosis
10) Hemoglobinuria
11) Parasitemia of > 5% (> 250 000/microlitre) in non-immune individuals

Adapted from *Management of Severe Malaria: A Practical Handbook*. 2nd ed. Geneva: World Health Organization.

Don’t forget

- Thin and Thick films
- CBC, Coagulation profile
- Random Blood glucose
- Urea and Creatinine
- LFT, Bilirubin
- Lactic acid
- ABG
- CXR
- Urine analysis

Basic Principles of Malaria Management

- Think of the diagnosis and do thick and thin blood films
- Ask lab about **species** of malaria – *falciparum* verus non-*falciparum* (*vivax, ovale, malariae*)
- Ask about percent parasitemia
  - If told greater than 1% parasitemia – think *PF*!
- Verify no evidence of severe or complicated malaria (no need for parenteral therapy)

Basic Principles of Malaria Management

- Medical Emergency
- Consider admission to hospital - especially for *falciparum* – at least observe tolerance of meds in ER
- FOLLOW UP FOLLOW UP FOLLOW UP
- Oral therapy:
  - Artemether-Lumefantrine
  - Atovaquone/proguanil (Malarone)
  - Quinine plus doxycycline/clindamycin
- Avoid mefloquine for treatment
- Parenteral therapy
  - Artesunate
  - quinine (or quinidine): needs telemetry

Algorithm for Malaria Management

IMMEDIATE blood smear thick and thin, CBC
blood culture, liver enzymes, glucose, serum creatinine, blood urea nitrogen

Malaria smear NEGATIVE

If symptoms (fever, 'flu-like illness) persist repeat malaria smears every 12 to 24 hours for a total of 3

Malaria smear POSITIVE

Determine species and % parasitemia

***Falciparum* species or species not known**

Treat as per guidelines Indication for parenteral therapy
(evidence of complicated malaria or severe nausea/vomiting)?

YES

Consider admission to intensive care unit.
Treat with parenteral artesunate or quinine/quinidine.
Change to oral therapy as soon as possible

NO

Treat with oral therapy.
Admit, or minimum of 8 hours' observation.
Ideally, before discharge ensure no increase in parasitemia

Non *falciparum* malaria

Falciparum antimalarials

Uncomplicated:

a) Oral quinine 600mg/8h **plus** doxycycline 200mg daily (or clindamycin 450mg/8hr) for 7 days

OR

b) Malarone®: 4 'standard' tablets daily for 3 days

OR

c) Riamet®: If weight >35kg, 4 tablets then 4 tablets at 8, 24, 36, 48 and 60 hours

BRITISH INFECTION SOCIETY

Health Protection Agency

Essential features of general management

- Commence antimalarials immediately (see boxes)

Severe malaria

- Consider admission to high dependency/intensive care
- Seek early expert advice from an infection or tropical unit
- Oxygen therapy
- Careful fluid balance (observe JVP, lying/sitting BP and urine output). Avoid hypovolaemia. Over-hydration may induce pulmonary oedema; consider CVP monitoring
- Monitor blood glucose regularly (especially during IV quinine)
- ECG monitoring (especially during IV quinine)
- 4-hourly observations until stable: ie pulse, temperature, BP, RR, SaO2, urine output & GCS. Regular medical review until stable
- Repeat FBC, clotting, U&Es, LFTs and parasite count daily
- In shock, treat for Gram negative bacteraemia

Falciparum antimalarials

Complicated or if patient is vomiting:

EITHER Quinine 20mg/kg loading dose **(no loading dose if patient taking quinine or mefloquine already)** as IVI in 5% dextrose over 4hr and then 10mg/kg as IVI over 4h every 8 hr **plus** oral doxycycline 200mg daily for 7 days (**In pregnancy, use IV/oral clindamycin 450mg/8hr**). Max quinine dose 1.4 g

OR If available, artesunate intravenously 2.4mg/kg at 0,12, 24 hrs then daily to complete a course of seven days plus doxycycline or clindamycin as above

When patient is stable & able to swallow, switch to oral quinine 600mg/8hr **plus** doxycycline 200mg daily (or clindamycin 450mg/8hr) to complete 7 days

Non *P.Falciparum*

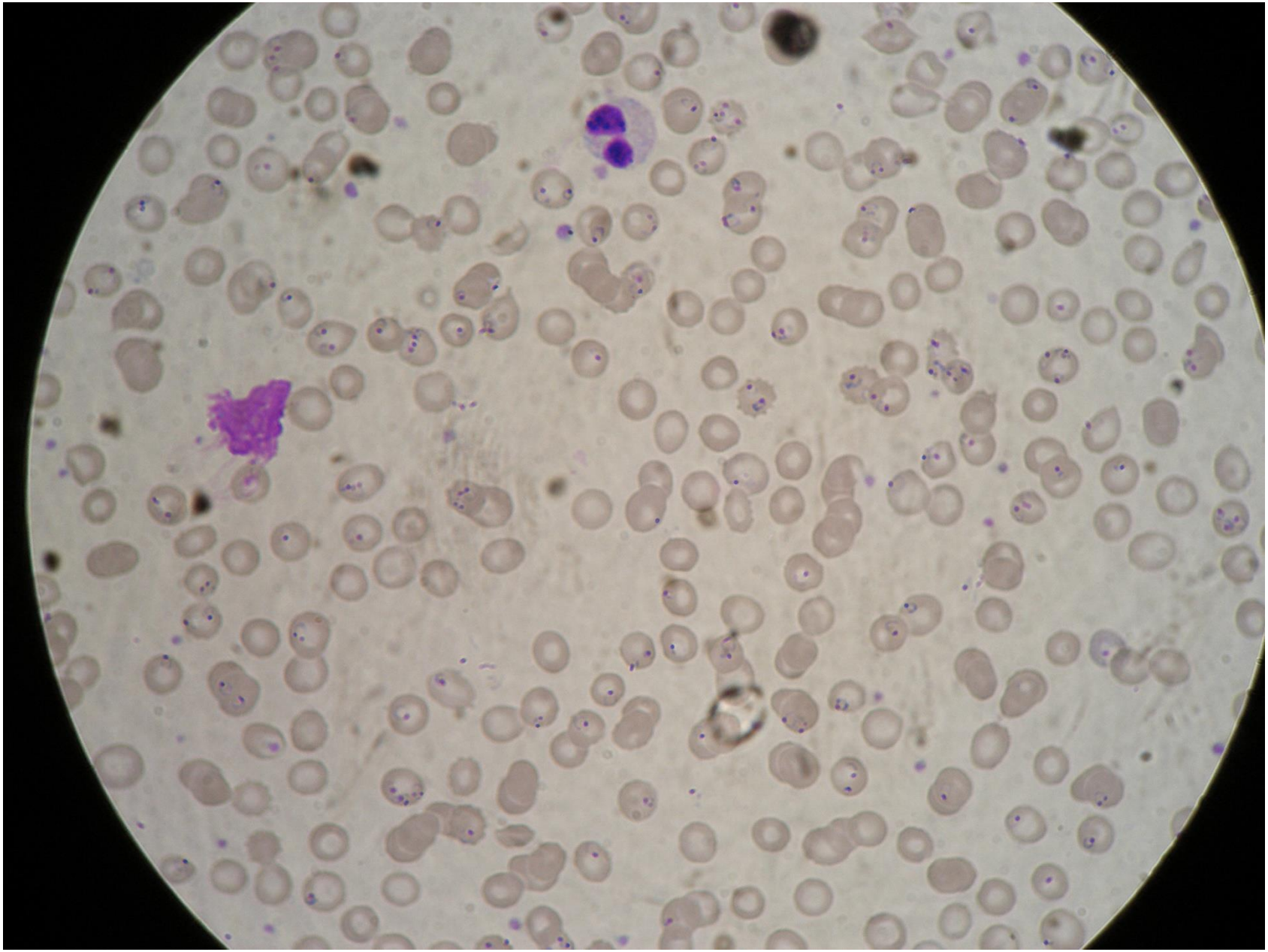
Non-falciparum antimalarials

Chloroquine (base) 600mg followed by 300mg at 6, 24 and 48 hours. **In vivax and ovale** after treatment of acute infection use primaquine (30mg base/day for vivax, 15 mg/day for ovale) for 14 days to eradicate liver parasites; G6PD must be measured before primaquine is given – seek expert advice if low

Case

- **18 year old pregnant woman returned from Jazan one week ago**
- **Fever and headache for 3 days**
- **Exam: Pale**
  Temp. 39°C
  Spleen enlarged

- **WBC 8, Hb 9.0 MCV 93, Plt 90, bilirubin 52**



Pregnancy and Malaria

- **Severe disease**
- **Primigravidae**
- **Risk of low birth & abortion.**
- **Risk of low glucose , pulm. oedema**

DRUG TOXICITY

- Quinine : hpoglycemia, arrhythmias, bitter taste , GIT upset , nausea, vomiting , tinnitus , high tone deafness
- Doxycycline : GI mupset, vaginal candidiasis
- Mefloquine : neuropsychiatric symptoms : mood changes .encephalopathy…transient
- Artemether-Lumfentrine: H/A, anorexia, dizziness, arthralgia and myalgia

PREVENTION

When travelling to malaria endemic areas

- Avoid mosquito bites
- long sleeved clothing
- Sleep in well – screened rooms
- Permethrin impregnated bed nets
- Insect repellents (DEET)
- Chemoprophylaxis

Chemoprophylaxis

Start 2 days pre-travel, continue 7 days after return:

- Atovaquone/ proguanil (Malarone) : 1 tab/d (250 mg atovaquone /100 mg proguanil)

One or two weeks pre-travel, continue 4 weeks after return:

- Mefloquine 250 mg once/wk
- Doxycycline 100 mg daily
- Primaquine 30 mg base daily
- Chloroquine sensitive areas: 500 mg (300 mg base) : once/wk

Malaria Vaccine

- RTS,S/AS01 (Mosquirix)
- Engineered from T-cell epitope in the pre-erythrocytic circumsporozoite protein (CSP) of *PF* malaria parasite and the envelope protein of HBsAg with an adjuvant AS01
- Efficacy of 25-50% in infants and young children

Fever in Returning Travelers

- The most common etiologies of fever in returning travelers are listed first:
- Dengue (flavivirus)
  - 4-7 day incubation, widespread in tropics (increasing in Africa), vector borne (*Aedes*)
  - Diagnosis: PCR, NS1 antigen; IgM only after day 4.
- Malaria (Plasmodia sp.)
  - 7-30 day incubation for *P. falciparum*, widespread but very high risk in Africa, vectorborne (Anopheles)
  - Diagnosis: blood smear, PCR, malaria RDT (rapid diagnostic test)
- Typhoid fever (Salmonella sp.)
  - Incubation 6-30 days, mostly South and Southeast Asia, fecal-oral transmission
  - Diagnosis: blood culture. Avoid Widal test
- Chikungunya virus
  - 4-7 day incubation, widespread in tropics, vector borne (*Aedes*)
  - Diagnosis: PCR; IgM only after day 4.

Fever in Returning Travelers

- Zika virus
  - Incubation 3-14 days, mostly Southeast Asia, little risk in Americas and Caribbean since 2016, vector borne (Aedes)
  - Diagnosis: PCR of blood or urine, IgM (high false-positive rate), Viral Neutralization is definitive, no testing available in someone with previous flavivirus infection of any kind
- COVID-19 (SARS-CoV-2)
  - Incubation most commonly 3-7 days, present in almost all countries, can be acquired in-flight or after return
  - Diagnosis: PCR more sensitive than antigen, very sensitive during febrile phase
- Leptospirosis
  - Incubation 2-29 days, South and South Asia, South America, transmitted from urine of infected rodents
  - Diagnosis: IgM only after day 5; PCR earlier.
- Rickettsial disease
  - Scrub typhus: incubation 6-20 days, Asia and northern Australia, chigger mites. Murine typhus worldwide.
    - Diagnosis: PCR (blood or eschar), IgM
  - Spotted fever group: incubation 2-14 days, widespread but highest risk with *R. Africae* in southern Africa, mostly ticks.
    - Diagnosis: PCR (blood or eschar), IgM/IgG
- Rabies
  - Incubation 20-60 days most common, widespread, animal or bat bite.
  - Diagnosis: PCR of saliva or skin, serum antibody detection
- East African trypanosomiasis
  - Incubation 7-21days, eastern and southern African game parks, tsetse fly.
  - Diagnosis: microscopy of blood films, lymph node aspirate, or chancre.

Fever in Returning Travelers

- Other frequent diseases in travelers: influenza A (seasonal), acute HIV, mononucleosis, measles, varicella, tuberculosis.
- Infrequent diseases in travelers to consider: Avian influenza (H5N1 & H7N9), African hemorrhagic fevers (Ebola incubation is 8-12 days), CCHF, yellow fever, Japanese encephalitis, Monkeypox (Nigeria and neighbors), relapsing fever, acute toxoplasmosis, arboviruses including Ross River, tickborne encephalitis, West Nile virus (emerging in Europe), hantavirus (both hantavirus cardiopulmonary syndrome and hemorrhagic fever with renal syndrome)

How Do You Know What Vaccines are Needed for Travel?

- The CDC's Health Information Website for Clinicians and Travelers
  - Published every 2 years
  - The "yellow book"
  - Available online at http://wwwnc.cdc.gov/travel/yellowbook/search.aspx

Travel Immunizations

- Required
  - Yellow Fever
  - Meningococcal
  - COVID-19

- Recommended
  - Polio
  - Tetanus/Diphtheria/Pertussis
  - Influenza
  - Measles
  - Hepatitis A/B
  - Typhoid
  - Rabies
  - Japanese Encephalitis
  - Tick-borne Encephalitis

Journal of
Nature and Science of Medicine
Official Publication of the College of Medicine, King Saud University

COVID-19 Vaccine in the Kingdom of Saudi Arabia: A True Operation Warp Speed

Mazin Barry[1*], Ahmed S. BaHammam[2,3]

Manufacturer	Vaccine Name	Vaccine Platform	Completed Clinical Trial	Efficacy	Most common Adverse Effects	Countries Authorized/rolled out the vaccine
Pfizer/BioNTech	BNT162b2	Modified mRNA	Phase III	95%	Local site pain, swelling	UK (Dec 2) Bahrain (Dec 4) Canada (Dec 9) **KSA (Dec 10)**
Moderna	mRNA-1273	Modified mRNA	Phase III	94%	Local site pain, swelling	USA (Dec 18) Canada (Dec 23) Israel (Jan 4) EU (Jan 6)
Oxford/AstraZeneca	ChAdOx1 nCov-19	Adenoviral vector encoding Spike protein	Phase III	62%-90%	Pain and swelling	UK (Dec 30) Argentina (Dec 30) El Salvador (Dec 30) India (Jan 1) Mexico (Jan 4) Dom. Rep. (Jan 6) Morocco (Jan 6)

https://www.jnsmonline.org/

ISSN 2589-6288

Yellow Fever

- Mosquito-borne hemorrhagic fever
- ~200,000 cases per year, 90% in Africa
- Indigenous case fatality rates vary
  - 20-60%
- Rare fatalities in travelers since vaccine introduction

Yellow Fever

- 3 stages
  - Infection (3-4 days)
    - Fever, malaise, leukopenia
  - Remission (48 hours)
    - Abatement of symptoms
    - 15% progress
  - Intoxication
    - Return of symptoms,
    - Organ dysfunction, hemorrhage

www.yellowfever.com.au/map2.gif

Yellow Fever

- Disease Transmission
  - From primates or humans
  - Mosquito vector
- Disease Prevention
  - Avoid mosquito bites
    - DEET
    - Clothing
    - Mosquito nets
    - Eliminate standing water
  - Vaccination

Yellow Fever Vaccine

- Live-attenuated vaccine
- Developed in 1936
- Seroconversion >95%
- Single 0.5ml subcutaneously
- Revaccination at 10-year intervals required by World Health Organization
  - Protection from one vaccine, however, may last 30 or more years

Yellow Fever Vaccine Contraindications

- Age <9 months old
    * Can consider at 6-9 months old during outbreaks
- Pregnant women
    * Yellow fever can cross placenta
- Severe egg allergies
- Severe immunocompromise
- Immunomodulatory drugs

Yellow Fever Vaccine Side Effects

- Adverse Reactions (10-30%)
  - Local soreness
  - Mild fever
  - Headache
  - Myalgias

Yellow Fever Vaccine
Rare Severe Reactions

- Anaphylaxis
  - Risk 1/131,000
- Yellow fever associated neurotropic disease (YEL-AND)
  - Risk 1:150,000 - 200,000
  - Multiple neurologic conditions
    - Encephalitis (esp. infants <9 months), Guillian-Barre, Bell's Palsy
  - Onset 2-28 days after vaccination
  - Rarely fatal

Yellow Fever Vaccine
Rare Severe Reactions

- Yellow fever associated viscerotropic disease (YEL-AVD)
  - Mimics severe yellow fever infection
  - Major organ system failure occurs
    - Hepatic, renal, circulatory failure
    - 50% or greater fatality rate
  - Occurs 1-8 days (average 3 days) after initial vaccination
  - Risk 1:200,000 - 300,000
    - Greater risk if over age 60

Yellow Fever Vaccine

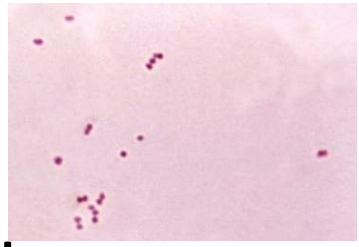
- Certification of vaccination required
  - International Certificate of Vaccination or Prophylaxis for Yellow Fever form (ICVP)
  - Must be signed by licensed physician or designee
- Waiver form for medical contraindication to vaccine (e.g. pregnancy)

Yellow Fever Vaccination Proof Required for Entry

- Angola
- Benin
- Bolivia (or signed affidavit at point of entry)
- Burkina Faso
- Burundi
- Cameroon
- Central African Republic
- Congo, Republic of the
- Côte d'Ivoire
- Democratic Republic of Congo
- French Guiana
- Gabon
- Ghana
- Liberia
- Mali
- Niger
- Rwanda
- São Tomé and Príncipe
- Sierra Leone
- Togo
- Always check up to date list at www.cdc.gov/travel

Meningococcal Disease

- *Neisseria Meningitidis*
  - Gram negative diplococci



- Youngest children = highest risk
- 0.5-10/100,000 in non-epidemic areas
- Up to 1,000/100,000 in epidemic areas

Meningococcal Disease

- "Meningitis Belt"
  - Sub-Saharan Africa
- Greatest risk: dry season (Dec. - June)
- Risk of travelers
  - 0.4/100,000
- Hajj pilgrimage to Saudia Arabia associated with outbreaks

http://wwwnc.cdc.gov/travel/images/380.ashx

Meningococcal Disease

- Vaccine required to attend the Hajj (annual pilgrimage to Mecca)
  - If under age 15, polio vaccination needed also

http://news.bbc.co.uk/cbbcnews/hi/pictures/galleries/newsid_1832000/1832100.stmproof

Meningococcal Disease

- Available vaccines
  - MCV4 (Menactra™)
    - Quadrivalent meningococcal polysaccharide–protein *conjugate* vaccine
    - 2-55 years old
    - Preferred in <11 year olds
  - MPVS4 (Menomune®)
    - Quadrivalent meningococcal *polysaccharide* vaccine
    - 2 years and older
    - Use for >55 years old
  - MenACWY-CRM (Menveo®)
    - Quadrivalent meningococcal oligosaccharide diphtheria CRM197 *Conjugate* Vaccine
    - 11-55 years old

Meningococcal Disease

- Revaccination
  - If high-risk (epidemic area or travel)
    - If vaccine given at 2-6 years old
      - Repeat after 3 years, then every 5 years
    - If vaccine given >6 years old
      - Repeat every 5 years

Hepatitis A

- Worldwide prevalence
- Fecal/oral transmission
  - Associated poor hygiene or sanitation
- Symptoms include
  - Jaundice
  - Fatigue
  - Abdominal pain
  - Anorexia
  - Nausea

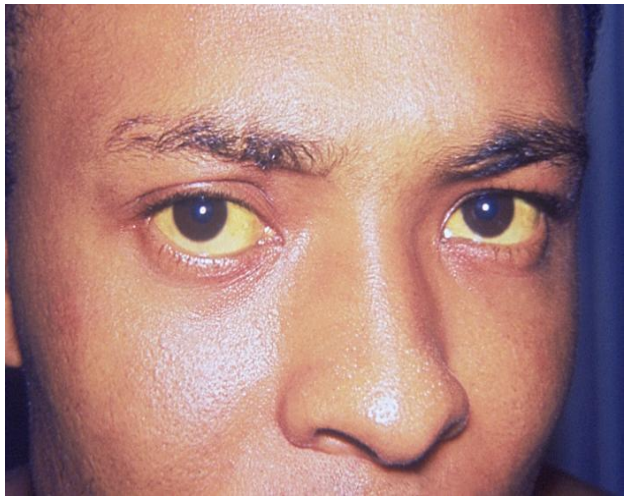


Photo from www.cdc.gov. Image in public domain.

Hepatitis A

- Adults often contract from asymptomatic children
- Incubation 28 days (range 15-50 days)
- Viral shedding 2 weeks before to 1 week after symptoms
- Usually self-limited disease

Hepatitis A Vaccine

- Inactivated Hep A virus (Havrix® or Vaqta®)
- Combined with Hepatitis B (Twinrix®)
- Travel vaccine indications
  - Anyone >1 year old traveling anywhere other than to:
    - U.S. and Canada
    - Western Europe
    - Scandinavia
    - Japan
    - Australia and New Zealand

Hepatitis A Vaccine

- Dose at 0 and booster at 6-12 months (Havrix®)
- Dose at 0 and booster at 6-18 months (Vaqta®)
- If using Twinrix® (combination Hep A and Hep B)
  - 0, 1, 6 months
  - 0, 7 days, 21-30 days and 12 months (4-dose accelerated series)

Hepatitis A

- For healthy patients <40 years old, one dose before travel confers adequate protection
- Consider immunoglobulin treatment for patients
  - Leaving in less than two weeks
  - Older
  - Immunocompromised
  - Chronic medical conditions
  - Under 12 months of age

Twinrix®

- Inactivated Hepatitis A with Recombinant Hepatitis B
- Indicated for 18 years old and older
- 3-dose series
- 0, 1, 6 months
- Better choice if both vaccines are indicated

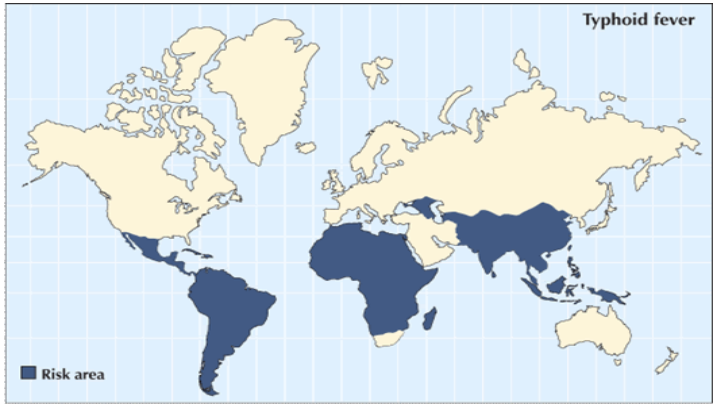
Influenza

- Risk depends on timing and destination
  - Tropics: year round risk
  - Temperate climates: risk generally April-September
- Avian subtype risks
  - Visiting poultry farms
  - Visiting open markets where live poultry are present
  - Eating undercooked poultry products (eggs, meat, etc.)
- Preventative measures include
  - Hygiene: washing hands
  - Annual vaccination

Typhoid Fever

- Typhoid fever – acute life-threatening illness
- Caused by *Salmonella typhi*
- Humans – only source
- Acquired through fecal contamination of food and water
- 22,000,000 cases worldwide/year
  - 200,000 deaths

Typhoid

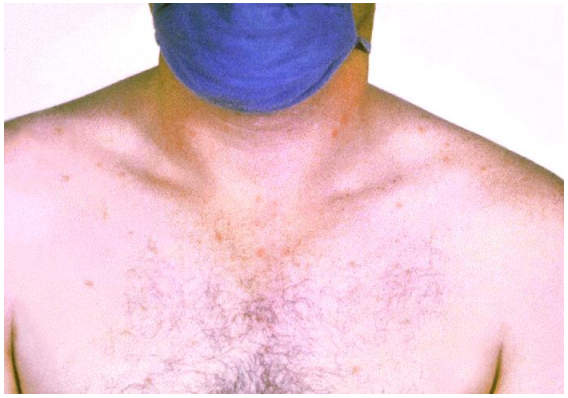


- Southeast Asia
  - 6-30 times more common
  - Highest risk of FQ drug resistance
- Africa, Caribbean, Central and South America
- Length of stay = increased risk

http://www.marioncountyhealthdept.org/images/Map_Typhoid.gif

Typhoid

- Incubation period: 6-30 days
- Headache, malaise, fever
  - Increasing in severity
  - Low-grade septicemia
  - “Rose spots” on trunk
- Serious complications (2-3 weeks)
  - Hepatosplenomegaly
  - Intestinal hemorrhage/perforation



Rose spots on the chest in a patient with typhoid

Photo from www.cdc.gov. Image in public domain.

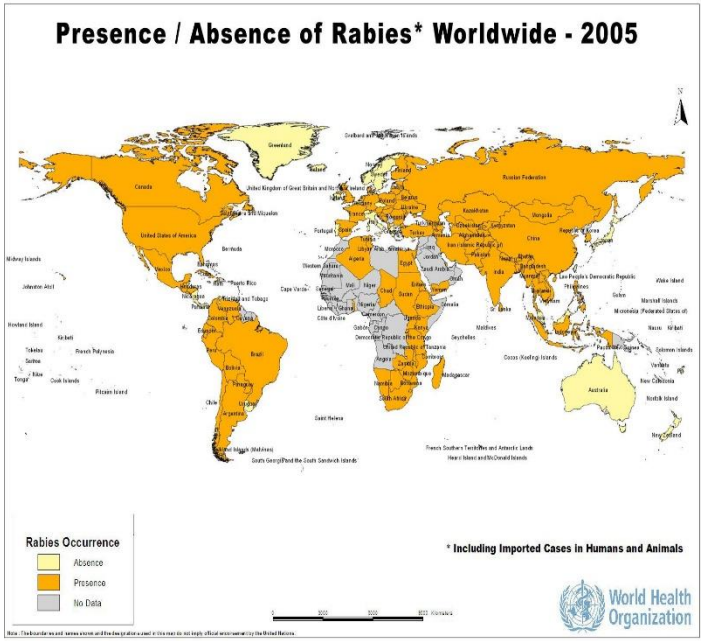
Typhoid

- Prevention
  - Avoid contaminated food and water
  - Hygiene
  - Local cuisine
- Vaccine(s)
  - 2 available

Typhoid Vaccines

- Vivotif®
  - Oral, live-attenuated
  - Ages 6 and older
  - 50-80% protection
  - 4 pills – one every other day
  - Completed 1 week before potential exposure
  - Revaccination every 5 years
- Typhim Vi®
  - Capsular polysaccharide (IM)
  - Ages 2 and older
  - 50-80% protection
  - Single 0.5ml injection
  - 2 weeks before exposure
  - Booster every 2 years

Rabies



- Found globally
- Consider vaccination
  - If potential exposure to wild animals (especially dogs)
  - Prolonged exposure where endemic

- http://www.who-rabies-bulletin.org/Travel/Images/Rabies_World_2015.JPG

Rabies Vaccine

- Pre-exposure prophylaxis
  - Series of 3 at 0, 7 and 21-28 days
  - 2 vaccines available
    - Imovax®
    - Rabavert®

Rabies Vaccine

- Post-exposure
  - Rabies Immunoglobulin (RIG) plus vaccine
    - RIG days 0, 4
    - Vaccine days 0, 3, 7,14
  - If had vaccine
    - No RIG needed
    - Vaccine days 0 and 3

Japanese Encephalitis Virus (JEV)

- Most common cause of encephalitis in Southeast Asia
- Carried by mosquitoes
- Risk
  - Little risk in urban areas
  - Mostly rural areas
    - Not recommended for short-term travel to urban area

Geographic distribution in Southeast Asia.

Map from www.cdc.gov

Japanese Encephalitis

- Incubation 5-15 days
- Most infections asymptomatic
  - <1% develop clinical disease
- Headache, fever, vomiting, diarrhea
  - Most recover in 1 week
  - 1:300 severe symptoms with 30% fatality
    - Mental status changes
    - Focal neurological deficits
    - Parkinsonian syndrome
    - Seizures (especially children)

Japanese Encephalitis

- vaccine
  - Inactivated Vero cell culture (JE-VC)
    - For people over 17 years old
    - Duration of protection unknown
    - Need for boosters undetermined
    - Pregnancy Category B

Malaria

- Prevention
  - Clothing
  - Insect repellant
  - Mosquito netting

- Chemoprophylaxis
  - Atovaquone/proguanil (Malarone®)
  - Primaquine
  - Chloroquine
  - Mefloquine
  - Doxycycline

Chemoprophylaxis

Start 2 days pre-travel, continue 7 days after return:

- Atoyaquone/ proguanil (Malarone) : 1 tab/d
  (250 mg atovaquone /100 mg proguanil)

One or two weeks pre-travel, continue 4 weeks after return:

- Mefloquine 250 mg once/wk
- Doxycycline 100 mg daily
- Primaquine 30 mg base daily
- Chloroquine sensitive areas: 500 mg (300 mg base) : once/wk

Personal Protection Measures

- Advise travellers to wear long-sleeved shirts and long trousers
- Apply insect repellent containing no more than 30% DEET, or use 20% or greater Picaridin
- At dusk, spray aerosolized insecticides (such as those containing pyrthrins) in living and sleeping areas
- Sleep in a screened or air-conditioned room
- Use bednetting of good quality with small mesh that is not damaged and impregnated with permethrin
- Pretreat clothing with permethrin

Travelers' Diarrhea Self-treatment: Antibiotics

- Antibiotic +/- loperamide
  - Quinolones: single dose, max 3 days
  - Azithromycin: single dose of 500mg max 3 days or one time dose of 1000 mg
  - Rifaximin
- Giardiasis (*giardia duodenalis*): rotten eggs burping, diarrhea
  - Metronidazole 250 mg po TID 7 d
  - Nitazoxanide 500 mg po bid 3 days

Advice for Acclimatization

- Tell climbers to avoid abrupt ascent to altitudes above 9850 ft
- Spend 2-3 nights at 8200-9850 ft before further ascent
- Add an extra night of acclimatization for every 2000-3000 ft of ascent
- Make day trips to higher elevation with return to lower elevation for sleep

Advice for Acclimatization

- Avoid alcohol and sedatives for the first 2 nights at altitude.
- Moderate exercise. Extreme exercise at altitude may be harmful
- acetazolamide 125-250mg bid starting 24 hours before ascent and continue for 48 hrs at maximum altitude
- Side effects: paresthesias, polyuria, nausea, drowsiness, impotence, myopia, bitter taste

STI's and Travel

- Greatest risk age 15-29, and in SE Asia and Gulf countries
- All travellers do more risk-taking behaviours while travelling
- Education: safe sex practices, especially use of condoms
- Sexual tourism is a big problem
- Abstain from sexual activity
- Use high quality condoms
- Limit consumption of alcohol, drugs

Contents lists available at ScienceDirect

IDCases

journal homepage: www.elsevier.com/locate/idcr

Unusual presentation of melioidosis in a returning traveler

Mazin Barry[a,*], Hebah Dada[b], Mohammad Barry[c], Abdulellah Almohaya[d],

42 Saudi Man with continuous fever for one month

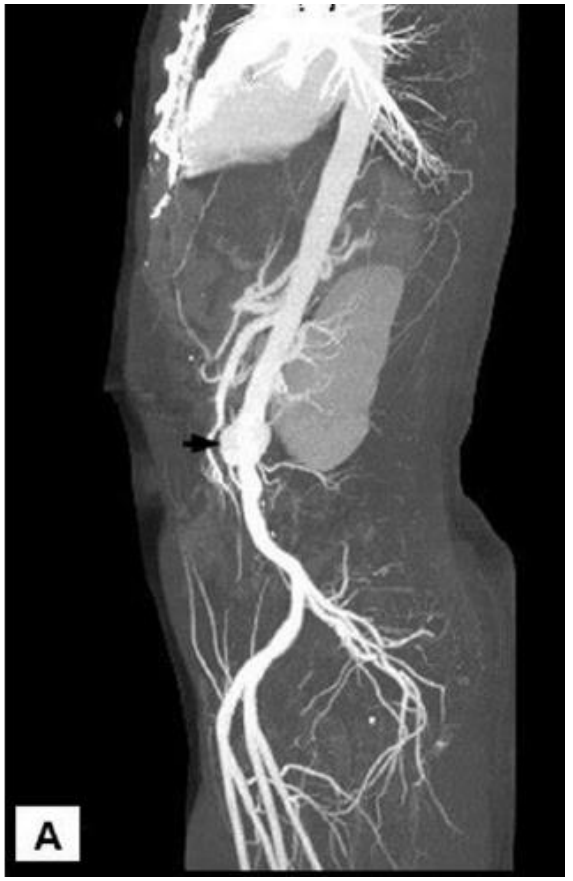
Chills, rigors, weight loss

2 weeks of mid-back pain radiating to flanks

1 month prior to onset of fever traveled to Thailand, visited rice fields

Blood culture grew:

Burkholderia pseudomallei causative agent of melioidosis



infrarenal abdominal aortic pseudoaneurysm