

Changing role of malaria as a global parasite: impact of travel deferrals in the developing countries

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Developing countries - hmhhh



Presentation Outline

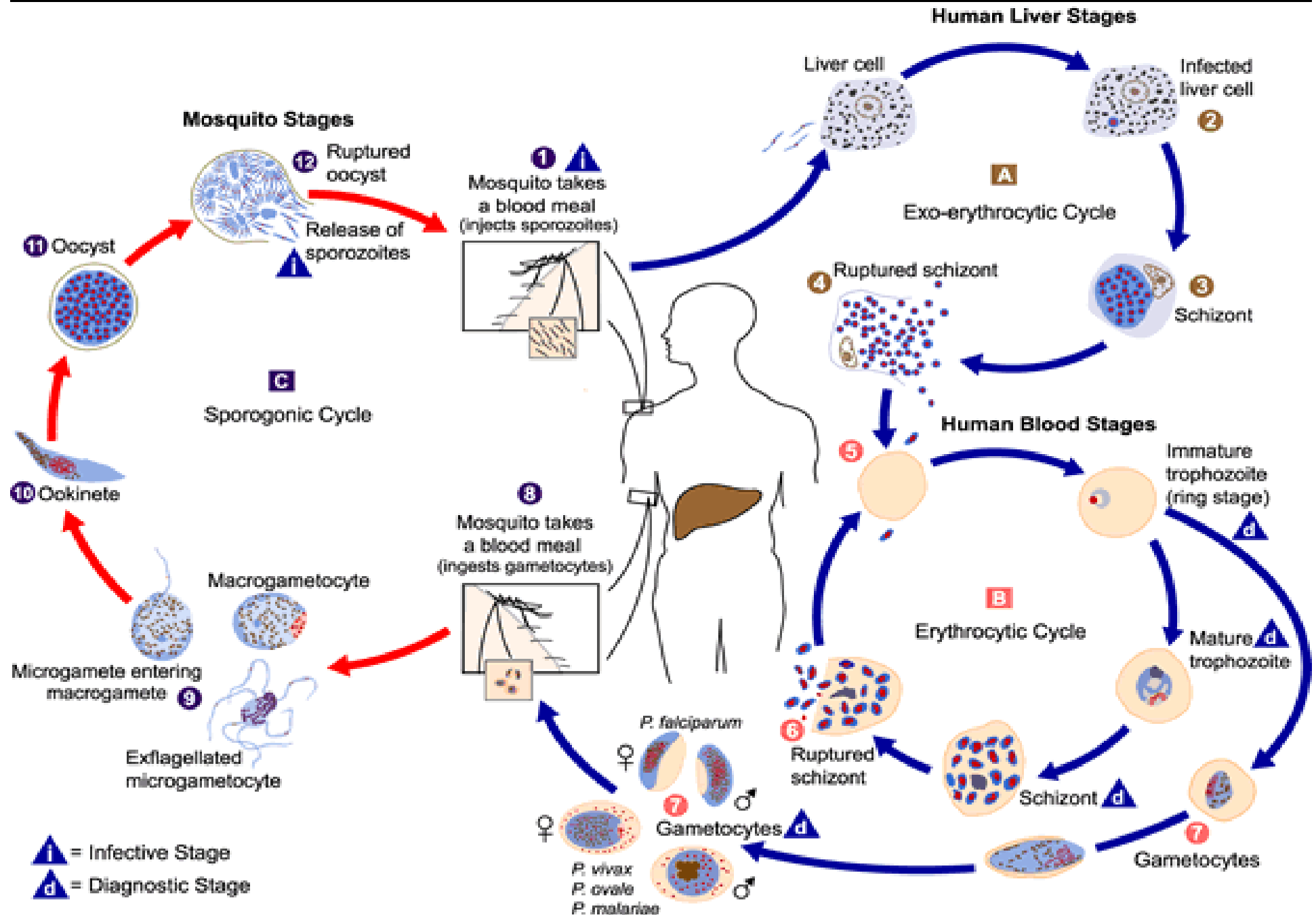
- Introduction
- Malaria as a global parasite
- Strategies and options for addressing transfusion transmitted malaria
- Use of tests for donor re-entry
- Prophylactic treatment of donors and recipients
- Issues and challenges
- Conclusions

Introduction: Why Malaria is a global parasite

- According to WHO in 2007:
 - **40% world's population is at risk of malaria**
 - An estimated **500 million cases** of malaria occur annually, with **> 1 million deaths**
- Malaria is **endemic in over 100 countries**, home to approximately 2.4 billion people
- Malaria is a **Transfusion Transmissible Infection (TTI)** first recognized as such in 1911
- **Travels** across borders (potential blood donors), makes malaria a global issue with regards to blood safety



LIFE CYCLE



Introduction: Why Malaria is a global parasite

- Malaria parasites survive ≥ 1 wk in blood components stored at room temperature or 4°C (Guerrero et al, 1983)
- Responsible for mortality and morbidity in blood recipients:
 - Williamson (1999) – SHOT, UK: 1 case of death from malaria
 - Slinger et al (2001) - Canada: 3 cases of malaria in blood recipients
 - Meija et al (2006) & Alkhunaizi et al (2008) respectively: case of malaria in liver and kidney transplant recipients
 - In the African context, paucity of data, but anecdotal evidence implies

Introduction: Why Malaria Transfusion is a concern in Africa and developing countries

- The WHO 8th WHA of 1955 excluded countries of mainland SSA from the Global Malaria Eradication Programme; today it is different
- **Yearly loss of productivity** in Africa from malaria is estimated at US\$12 billion
- The **need for blood transfusions are high in the African Region** due to:
 - High maternal mortality, mainly from haemorrhage (25-40%)
 - High infant mortality
 - Infections: HIV/AIDS, Hepatitis, Malaria
 - Malnutrition
 - Haemoglobinopathy
 - Road Accidents

Introduction: Why Malaria Transfusion is a concern in Africa and developing countries

- According to AFRO (2002), **60% of the world's blood needs are required in the African Region**, yet only about **3%** occurs there
 - For instance, of about 12 millions units required in 1999, only 30% were collected
- Thus, there is already an acute shortage of blood in the region

Introduction: Why Malaria Transfusion is a concern in Africa and developing countries

- Furthermore, the prevalence of malaria is high in blood donors
- In Endemic countries:
 - Reports from some tropical countries show malaria prevalence among blood donors:
 - Nigeria and Benin >30% (Okocha et al, 2005; Uneke et al, 2006, Kinde-Gazard et al, 2000)
 - Cameroon ~ 66.5% in antigenic analysis (Mbanya, 2002)
- In Low or non-endemic:
 - Pockets of transmission: Egypt, South Africa, Mauritius, Mexico...; thus limited risks
 - Virtually no risks in Lesotho
 - Complete eradication: Tunisia

Strategies and options for addressing transfusion transmitted malaria

Main Strategies and options to address malaria as a TTI include:

- Deferrals
- Tests to re-entry donors
- Prophylactic treatment of donors and recipients
- Others

Travel deferrals

- Why travel deferrals?
 - To allow for parasites to be totally cleared from the donor's system
 - To ensure removal of the risk of transfusion-transmitted malaria (TTM)
- Who is affected ?
 - Potential blood donors
 - Potential blood recipient (if no deferrals; shortages)
- Guidelines available in developed countries, but not so for developing ones

Travel Deferrals

Based on FDA Guidelines for Donor Deferral - 1994 Memorandum

- Three-year deferral:
 - History of clinical malaria
 - Prior residents of endemic country
- One-year deferral:
 - Residents of non-endemic countries who visit a malaria endemic area
- These measures are adopted and adapted to different settings & cultures:
 - If antibody-negative at 4months after return from endemic area; re-entry allowed (France)
 - Indefinite deferral: If history of residing in endemic countries, or diagnosed with malaria (UK)

Use of tests for donor re-entry

- Rational for tests
 - Donor testing to exclude infected donors & reduce risk of transmission to recipients (demonstration of parasite in blood)
 - Donor testing to reduce deferral period, especially when parasite/antibody-free . Thus, need for very sensitive assays for early detection of antibody
- Tests methods currently used
 - Direct methods
 - Indirect methods

Direct Method: Ross, 1903

THE LANCET.

A Journal of British and Foreign Medicine, Surgery, Obstetrics, Physiology,
Chemistry, Pharmacology, Public Health, and News.

IN TWO VOLUMES ANNUALLY.

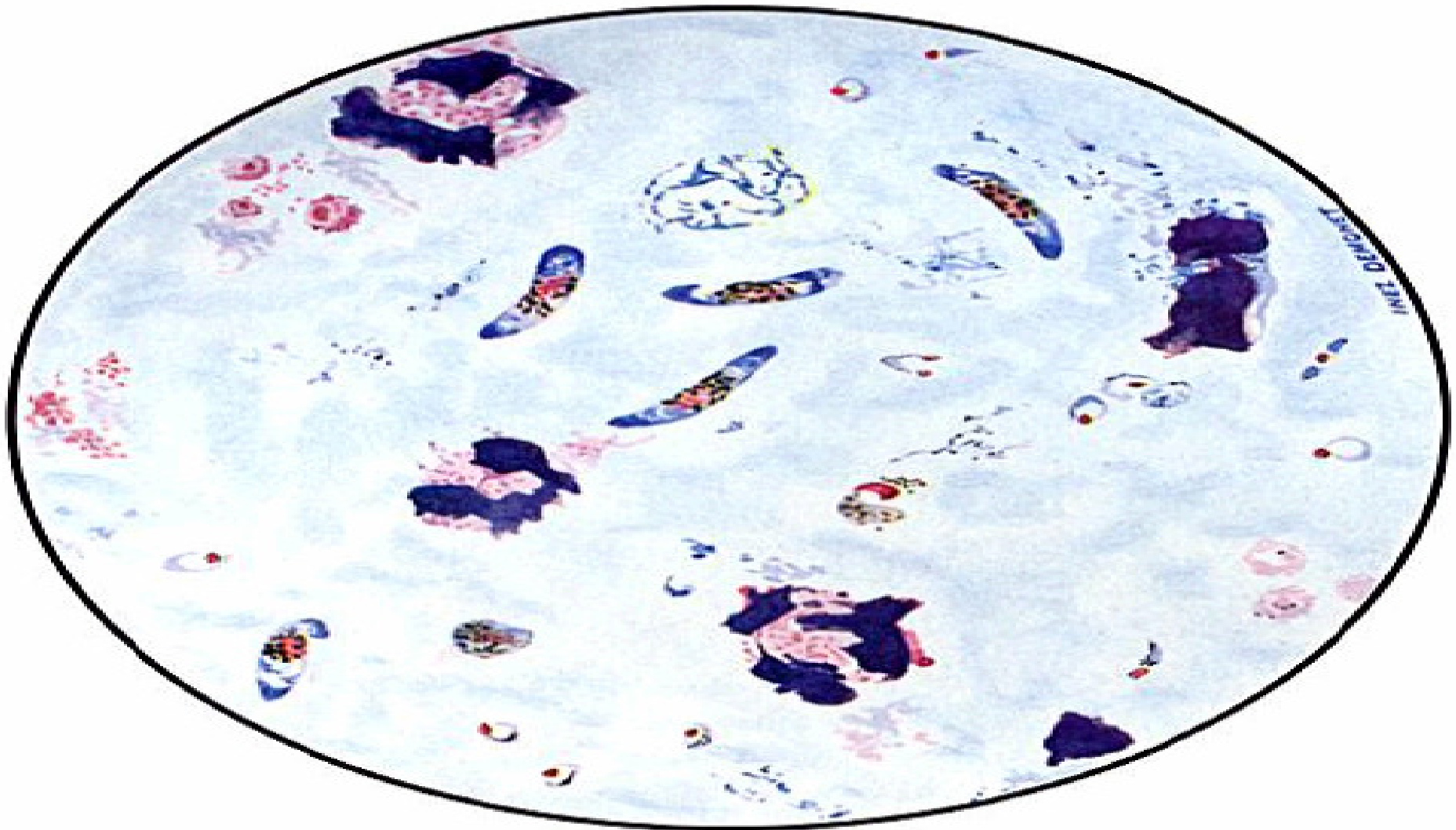
VOL. I. FOR 1903.

AN IMPROVED METHOD FOR THE MICRO-
SCOPICAL DIAGNOSIS OF INTER-
MITTENT FEVER.

BY RONALD ROSS, C.B., F.R.S., F.R.C.S. ENG., D.P.H.,
LECTURER ON TROPICAL MEDICINE AT UNIVERSITY COLLEGE, LIVERPOOL;
WALTER MYERS LECTURER AT THE LIVERPOOL SCHOOL OF
TROPICAL MEDICINE; LATE MAJOR, I.M.S.

Plasmodium falciparum: Thick Blood Smear

Adopted from Sanjai Kumar, 2005



Use of tests for donor re-entry

Direct Methods to Detect Malaria Parasites

- Direct parasite demonstration
 - Microscopy: Thin and Thick blood films
 - Quantitative Buffy Coat parasite detection (costly, non-specific)
- Immunochromatographic methods
 - Ag and Antibody detection
- DNA Based Methods : PCR; NAT

Indirect Methods to Detect Malaria Parasites

- Antibody based methods:
 - ELISA (detects *P. falciparum* & *vivax* only)
 - Indirect Immunofluorescence methods

Strategies and options

Prophylactic treatment of donors and recipients

Depends on area, specie and resistance status, drugs used may include:


- Chloroquine & proguanil
- Mefloquine
- Pyrimethamine-sulfadoxine (Fansidar)
- Pyrimethamine-Dapsone (Maloprim)
- Alovaquone & Proguanil (Malarone)
- Doxycycline
- Clindamycin Halofantrine

Prophylactic treatment of donors and recipients

- Newer drugs used:
 - Artemisinin or Qinghaosu
 - Artemether
 - Artemether & Lumefantrine (Coartem, Riamet)
 - Artesunate
- Unpublished data: **Antimalarial drugs administered in potential donors and/or blood recipients in endemic areas**
- Rajab et al (2005): Nairobi, evaluated costs of **predonation screening (US\$0.03), vs post transfusion prophylaxies (US\$1.4 – 7.79)**

Other Strategies

Standard malaria preventive strategies

- Prevention of mosquito bites and transmission
 - Vector control:
 - Use of ITNs
 - Removal of stagnant water pools
 - Insecticides: Indoor residual spraying
- 

Issues and Challenges: Effectiveness of measures

- Only **a few parasites present** in a unit of donor blood can cause TTM.
- **As few as 10 *P. vivax* parasites** in blood can transmit virulent infection to humans
- ***P. malariae* has natural lifespan up to 40yrs**, maintaining sub-latent level of blood infection
- Both microscopy and DNA based tests are highly sensitive, but **unsuitable for large blood volumes**
- Antibody-based ELISA is used by European countries
- Detects antibodies **only for *P. falciparum* and *P. vivax*** malaria with limited sensitivity

Other issues and challenges

- What is the **impact of re-entry donors**?
- Should all selected donors be regularly screened for MP in developing countries? **Feasibility?**:
 - Human resources?
 - Infrastructure? Logistics? Reagents?
- How should **special cases** be considered such as pregnant women, young children – the most vulnerable and most needing of blood

Issues and challenges in developing countries: Underlying aggravating factors

- The severity of malaria is compounded by the **high burden of immunosuppression** (HIV/AIDS, malnutrition), haemoglobinopathies) etc.
- **Poor health infrastructures**, shortages of reagents, supplies, staffing, logistics, appropriate equipment, drugs
- Poverty, **cultural sensitivities**, myths, traditions
- **Multidrug resistant malaria**
- Insecticide resistance

Conclusions

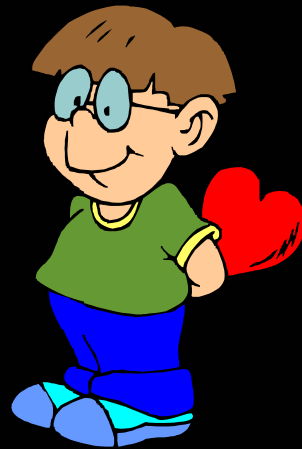
- In the absence of an effective vaccine, and with the risk of deferring the already few safe donors, the prevention of mosquito bites and transmission and use of medication remain the most feasible and potent options in developing settings
- There is need for innovative methods: tools detecting latent & asymptomatic infections; fixed dose combination drugs with varying phase activity; longer lasting ITNs...

Conclusions

Malaria defeated the international community many years ago. We cannot allow this to happen again. A single global action plan for malaria control, that enjoys partnership-wide support, is a strong factor for success."

(Margaret Chan, Director-General of the World Health Organization)

THANK



YOU FOR YOUR

ATTENTION

No deferrals for an occasional beer

