Malaria in the United States military and its implications for the safety of the blood supply?

Christian F. Ockenhouse M.D., Ph.D.
Colonel, Medical Corps, U.S. Army
Walter Reed Army Institute of Research
Silver Spring, MD 20910
chris.ockenhouse@na.amedd.army.mil

Malaria Infection in U.S. Military

"The history of malaria in war might almost be taken to be the history of war itself"
C.H. Melville, 1895

- 1995 - 2002 : ~ 35 – 100 cases of *Plasmodium* per year
- ~ 60% cases *P. vivax*, ~ 40% *P. falciparum*

- Vietnam- Leading Cause of Med Disability
- Somalia 1993: > 300 cases
- Liberia, August 2003: 80 cases
- Iraq & Afghanistan
- Republic of Korea
- In the past 5 years:
  - 11 cases of severe and complicated malaria
  - Two deaths: Special Forces Soldiers
  - All were non-compliant with Lariam or Doxycycline prophylaxis

Malaria Infections from Blood Donation in U.S. Military

How safe is the blood supply against
malaria infection for U.S. military personnel?

Extremely safe!

U.S. military follows recommendations on donor deferral policy

exceptions: fresh whole blood in emergencies – mass casualty

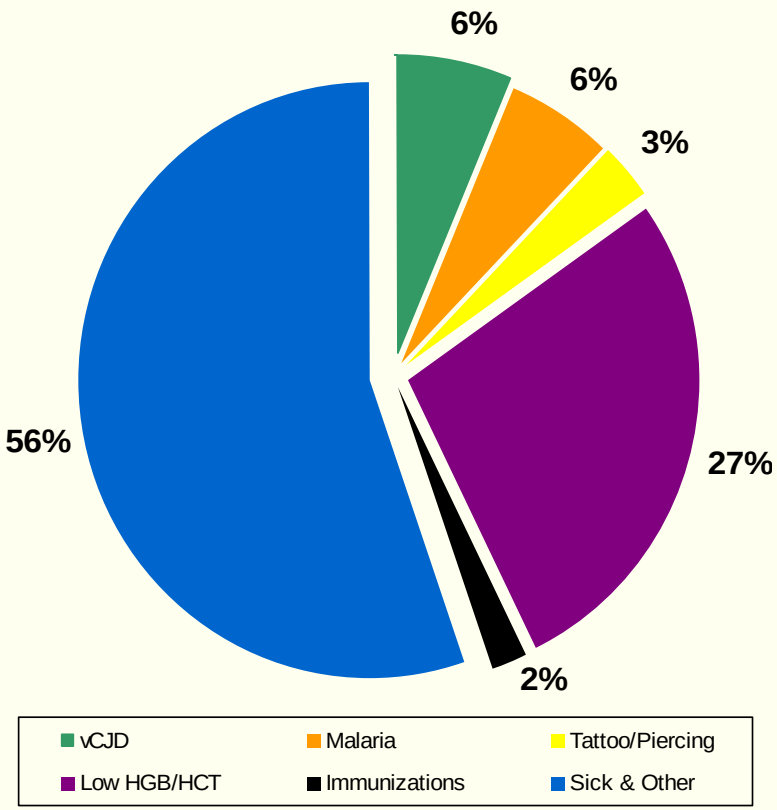
Data from 1996-2006: 3 cases of malaria infection coincident with blood transfusion

Case 1: *P. vivax* malaria occurs in person 149 days post blood transfusion
Case 2: *P. vivax* malaria occurs in person 720 days post blood transfusion
Case 3: *P. falciparum* malaria occurs in person on same day as blood transfusion

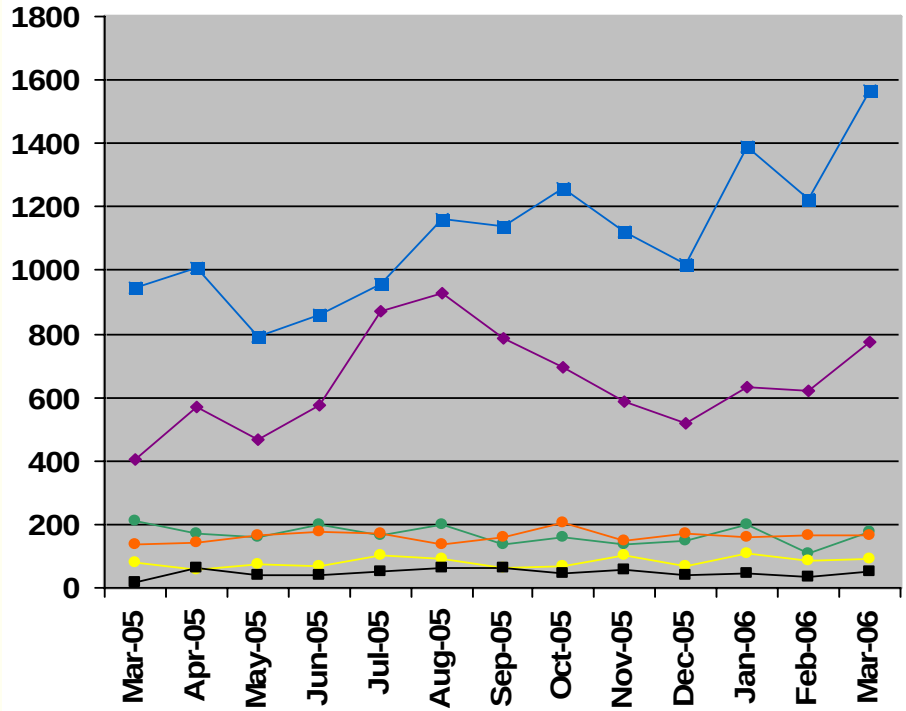
All cases have history consistent with natural exposure to malaria

Deferrals by Type

March 2006 Deferrals



Historical Monthly Deferrals



Information provided by Armed Services Blood Program Office

What is the problem that demands a solution?

1. Is there evidence that the blood supply poses an unacceptable risk from malaria (using current policies of donor deferral)?

If yes, then screen blood for presence of malaria

2. Due to existing deferral policies, are we at risk of permanently losing potential blood donors?

If so, how can we minimize the impact?

a. screen blood for presence of malaria (active vs. passive)
b. change policy for deferral to retain potential donors that pose low risk

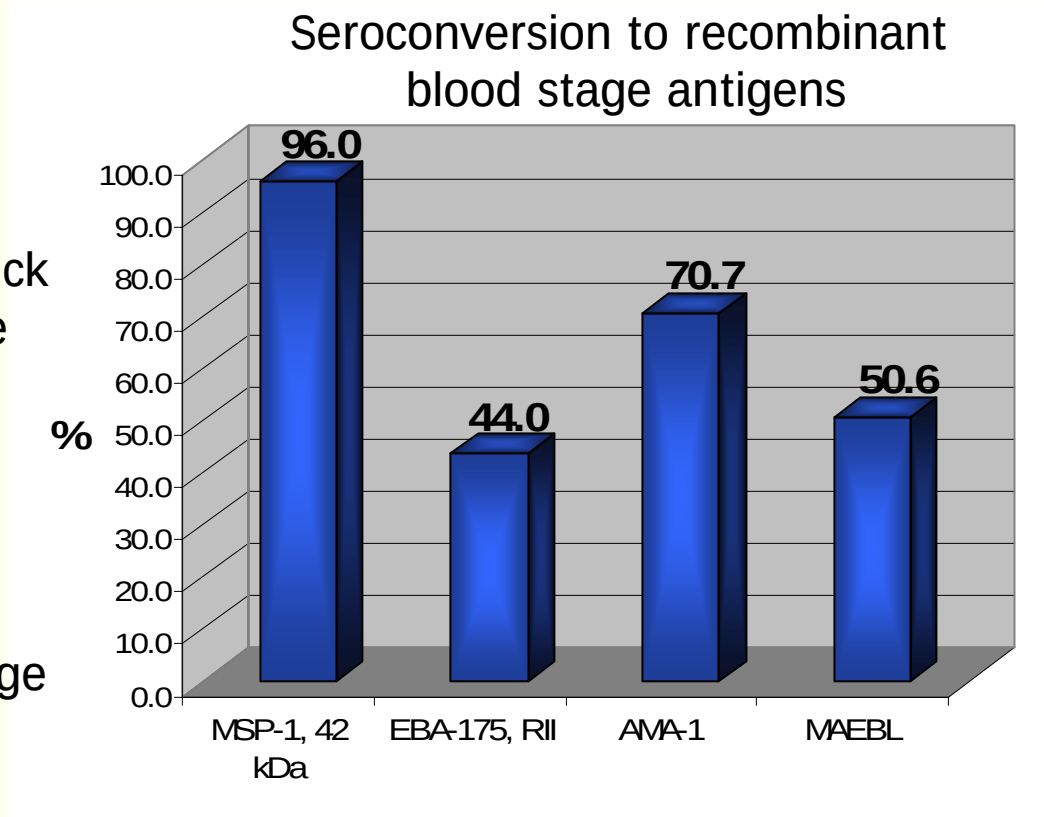
Testing for malaria infection in blood donors (USA)

1. Active detection – detecting presence of malaria parasite in whole blood
   - NAT (nucleic acid testing)
   - Detection by enzymatic reaction with parasite by-products (HRP, pLDH, etc.)

2. Passive detection – detecting malaria-specific antibodies
   - ELISA

Detecting *P. falciparum* - specific antibodies in non-immune healthy subjects after experimental challenge with malaria

- Malaria challenge: 5 infected mosquito bites
- monitor daily after day 5 for presence of blood stage parasites
- on day of 1 positive parasite by thick blood smear treat with curative dose of anti-malarial (parasite load ~ 1 parasite/ul
- on weekly follow-up for 4 weeks collect plasma to detect presence of anti-malarial antibodies to defined recombinant P. falciparum blood stage proteins by ELISA



Time interval between detection and presence of antibody= 10-30 days from 75 subjects

Identify high risk donors by better screening?

- non-immune travelers are not high risk!
  - it is highly unlikely that a non-immune asymptomatic blood donor carries malaria parasites in blood (unless parasite density < clinical threshold)
- residents from endemic countries may be asymptomatically infected with malaria
  - continue deferral policy
  - alter deferral policy
  - screen blood for malaria
  - cost-benefit ratio